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T H E
MARINER'S
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CONTAINING

The Principles of Arithmetic and Practical Geometry ;
with the Extraction of the Square and Cube Roots :
Also Rules for finding the Prime, Epact, Moon's
Age, Time of High-Water, with Tables for the same.

T O G E T H E R W I T H

Exact Tables of the Sun's Place, Declination, and Right-Ascension : Of the Right Ascension and Declination of the Principal Fixed Stars : Of the Latitude and Longitude of Places : A large Table of Difference of Latitude and Departure, for the exact Working a Traverse.

A L S O

The Description and Use of the Sea-Quadrant, Fore-Staff and Nocturnal : Necessary Problems in Plane-Sailing and Astronomy, wrought by the Logarithms, and by *Gunter's* Scale : A Tide Table : The Courses and Distances on the Coast of *Great Britain, Ireland, France, &c.* And the Soundings at coming into the Channel : With Directions for sailing into some Principal Harbours.

B Y

NATHANIEL COLSON, *Student in the Mathematics.*

The whole revis'd, and adjust'd to the NEW STYLE,
By WILLIAM MOUNTAINE, F.R.S.

London : Printed for J. MOUNT and T. PAGE,
on *Tower-Hill*, 1764.

Where you may have all Sorts of Mathematical Books.

To the Ingenious MARINER.

I Here present thee with a New Calendar, wherein I have endeavoured, not to puzzle thee with unprofitable Problems, (a Thing too much practised) but to make Things plain and practicable: Here is nothing obscure or difficult to discourage young Beginners (for whom 'tis intended) but all Things treated of with as much Plainness (both as to Matter and Method) as possible; and I assure thee was I present to instruct thee, I could by no means render things more intelligible than I have here done: I have endeavoured to omit nothing that might be materially useful, having respect to the design'd bigness of the Volume. The Contents are as follow:

The Principles of Arithmetic, with which I begin, because I am sensible of the Loss some have been at, that have attempted Navigation before they have understood something of it; the Extraction of the Square and Cube Roots; In all which I have endeavoured to apply the Examples to Sea Affairs: Some necessary Geometric Problems, useful in Navigation; Directions for finding the Prime, Epact, Moon's Age, and the Time of Full Sea (both according to the ordinary and a more accurate Way) with Tables for the same.

Tables of the Sun's Place and Declination, with Directions and Examples to every Case, how to use the Declination to find the Latitude: As also the necessary Tables for correcting the Declination, when the Difference of Longitude is considerable from the Meridian of London, for which the said Tables of Declination are calculated: A Table of the Sun's Right Ascension: A Table of the Right Ascension and Declination of some of the principal fixed Stars, with the use of the said Tables in finding the time of a Stars coming to the Meridian; as also Directions at large for Observation of any of the said Stars to find the Latitude of the Place, with Examples in each Case. The Description of the Sea-Quadrant, Fore-staff and Nocturnal: A Table of Latitude and Longitude of the principal Places on the Sea-Coast, collected from the best Information. Problems in Plane Sailing and Astronomy, (which that the Practitioners might learn two things at once) are wrought both by the Logarithms, and Gunter's Scale: A large and very useful Table of Difference of Latitude and Departure to every Degree and Quarter Point of the Compass; With its use in working a Traverse in order to keep a Reckoning at Sea: A Rutter for the Coast of Great-Britain, France, Ireland, Spain, Portugal, &c. Shewing the Bearing and Distance from one Place to another: A Table of the Soundings coming into the Channel, giving the Depth of Water, and Quality of the Ground; Lastly, Directions for sailing into some principal Harbours; By all, or any of which, if thou art by any means profited (as I know thou mayest, if thou wantest Information in any of these Things, and dost but carefully animadvert upon what thou readest) I have my End; And thy kind Acceptance hereof will further oblige



Thy sincere Friend,

Nathaniel Colson.

*The Principles of Arithmetic briefly and plainly demonstrated,
with the Extraction of the Square and Cube Roots.*

BECAUSE of the Usefulness and Necessity of some Knowledge of *Arithmetic*, in the Art of *Navigation*, it is requisite to begin with that, without which no orderly Procedure can be made; and first of

Numeration.

Numeration is that part of *Arithmetic*, whereby one may rightly express the Value of any Number proposed.

All Numbers are expressed by these Characters following.

1, 2, 3, 4, 5, 6, 7, 8, 9, 0.
One, Two, Three, Four, Five, Six, Seven, Eight, Nine, Cyphers,

Altho' Cyphers signify nothing by themselves, yet being put before (or to the Right-Hand of) other Figures, they increase their Value as much as if they were all Figures, as may plainly be seen in the Table following.

1	Units	1
12	Tens	10
123	Hundreds	100
1234	Thousands	1000
12345	X Thousands	10000
123456	C Thousands	100000
1234567	Millions	1000000
12345678	X Millions	10000000
123456789	C Millions	100000000

Figures have their Value according to the Places they are set in, as 1 in the first Place, or Places of *Units*, is *One*; in the second Place *Ten*; in the third Place *One Hundred*; in the fourth Place *One Thousand*; in the fifth Place *Ten Thousand*, &c.

The Table directs how properly to express any given Number; As 123 which Number consisting of three Places, is thus numbred, *One Hundred Twenty Three*; this Number 123456, consisting of six Places, is thus expressed, *One Hundred, Twenty Three Thousand, Four Hundred Fifty-six*; and this Number 123456789, consisting of nine Places, is thus numbred, *One Hundred Twenty-three Millions, Four Hundred Fifty-six Thousands, Seven Hundred Eighty-Nine.*

Addition

Addition is that which makes but one Sum of several

Example. Suppose four Men (A. B. C. D.) owe me several Sums of Money, I would know how much is due to me in the whole: I begin at the first Row towards the Right-Hand and say, 3 and 6 is 9 and 2 is 11, and 4 is 15; setting down the 5 under the Row added up; then I carry the 1 ten to the next Row, saying 1 and 4 is 5, and 5 is 10, and 3 is 13, and 6 is 19; set down 9 under the Row, added up, and carry 1 to the next row, saying 1 and 8 is 9, and 1 is 10, and 4 is 14, and 5 is 19; set down 9 and carry 1, which 1 and 1 is 2, and 3 is 5, and 5 is 10, and 3 is 13, which because this is the first row, I set down: So that by this *Addition*, the whole Debt is found to be *Thirteen Thousand, Nine Hundred, Ninety-five Pounds*.

A oweth	3564
B	5432
C	3156
D	1843

13995

Characters used in Arithmetic.

Exam. 2. Suppose I have several Creditors to whom I owe several Sums of Money, I desire to know the whole.

Beginning again (as before in *Addition*) at the Right-hand, I say 11 and 10 is 21, and 4 is 25, and 6 is 31; now considering how many Shillings there are in 31*d.* I find 2*s.* and 7*d.* whereof I set down the odd 7*d.* under the row of Pence, and carry the 2*s.* to the next row being Shillings, saying 2 and 4 is 6, and 8 is 14 and 9 is 23, and 11 is 34, that is 1*l.* 14*s.* set down 14*s.* and carry the 1*l.* to the next row, saying, 1 and 3 is 4, and 6 is 10, and 5 is 15, and 3 is 18; set down 8 and carry 1; then 1 and 3 is 4, and 5 is 9, and 3 is 12; set down 2 and carry 1: Lastly, 1 and 1 is 2; so that by this *Addition* the whole Debt is, *Two Hundred Twenty Eight Pounds, Fourteen Shillings and Seven Pence.*

{ l. }	Pounds.
{ s. }	Shillings.
{ d. }	Pence.
{ ° }	Degrees.
{ ' }	Minutes.
{ " }	Seconds.

l.	s.	d.
33	11	06
55	09	04
36	08	10
103	04	11
228	14	07

Exam. 3. Suppose at Sea, keeping my Reckoning in Degrees and Minutes, having six Days Difference of Longitude, I would know how much the whole is.

Say 13 and 2 is 15, and 9 is 24, and 56 is 80 and 6 is 86; now 60 Minutes making a Degree, set down the odd 26 Minutes under the row of Minutes, and carry the 1 Degree to the next row, being Degrees; saying 1 that I carried and 1 is 2, and 1 is 3, and 2 is 5, and 1 is 6, and 1 is 7, so that the whole Difference of Longitude made these 6 Days, is 7 Degrees and 26 Minutes.

	°	'
1 Day	1	06
2 —	0	56
3 —	1	09
4 —	2	00
5 —	1	02
6 —	1	13
0 —	7	26

Subtract.

SUBTRACTION.

Subtraction is the taking of a less Sum out of a greater, and finding the Remainder.

Example. Suppose a Man oweth me — — — 376: 13: 06
And hath paid me — — — 211: 05: 08

I desire to know what remains unpaid, which is — — — 165 : 07 : 10

To work this I say, 8 from 6 I cannot, but considering there is 12 Pence contained in a Shilling, I add, 12 to 6, and say 8 from 18, and there remains 10, which set down under the Pence; and then having borrowed 1, I go to the next Row, and say, 1 that I borrowed and 5 is 6, which take out of 13, there remains 7; then proceeding to the Pounds, I say, 1 from 6 there remains 5, and 1 from 7 there remains 6; and lastly, 2 from 3, there remains 1: so there remains due of the said Debt, *One Hundred Sixty Five Pounds, Seven Shillings, Ten Pence.*

Example 2. Suppose the Distance between two Places to be 1000 Miles, and that I have sailed 396, and desire to know how many Miles I have to Sail.

Placing 396, under the 1000, I say, 6 from 0 I cannot, but 6 from 10 there remains 4; proceeding to the next Figure I say, 1 that I borrowed and 9 is 10, from 0 I cannot, but 10 from 10 there remains 0: Again, 1 that I borrowed and 3 is 4, from 0 I cannot; but 4 from 10, there remains 6: Lastly, 1 that I borrowed from 1, there remains 0: So there remains 604 Miles.

Example 3. Suppose one Place in the Latitude of 51 Deg. 32 Min. N. and another in the Latitude of 42 Deg. 10 Min. N. I would know the Difference of Latitude between them.

To do which, subtract the less Latitude out of the greater thus; the lesser being placed undermost, say, 10 from 32, there remains 22, which place under the Minutes; then for the Degrees, 2 from 1 I cannot, but 2 from 11, there remains 9; then 1 that I borrowed, and 4 is 5, 5 from 5 there remains 0.

d.	m.
51	32
42	10
9	22

So the Difference of Latitude is 9 Deg. 22 Min.

MULTIPLICATION.

M*ultiplication* is that which serves instead of many Additions, by which any Number of a greater Denomination is brought into a less, as Pounds into Shillings, Shillings into Pence, and Pence into Farthings; Degrees into Minutes, Minutes into Seconds, and the like; which is done by multiplying the Number of the greater Denomination, by that number of the lesser which is contained in one of the greater; as the multiplying any Number of Pounds by 20 (the Number of Shillings contain'd in a Pound) brings it into Shillings, and so of the rest.

Multiplication consists of Three Parts.

1. The Multiplicand, or Number to be multiplied.
2. Multiplier, or Number by which to multiply.
3. The Product made by the Multiplication.

For the Learner's more ready Procedure herein, it is necessary insert the following Table which is first to be committed to Memory. The

MULTIPLICATION.

The Multiplication TABLE.

2 times	$\begin{Bmatrix} 2 \\ 3 \\ 4 \\ 5 \\ 6 \\ 7 \\ 8 \\ 9 \end{Bmatrix}$	is	$\begin{Bmatrix} 4 \\ 6 \\ 8 \\ 10 \\ 12 \\ 14 \\ 16 \\ 18 \end{Bmatrix}$	4 times	$\begin{Bmatrix} 4 \\ 5 \\ 6 \\ 7 \\ 8 \\ 9 \end{Bmatrix}$	is	$\begin{Bmatrix} 16 \\ 20 \\ 24 \\ 28 \\ 32 \\ 36 \end{Bmatrix}$	7 times	$\begin{Bmatrix} 7 \\ 8 \\ 9 \end{Bmatrix}$	is	$\begin{Bmatrix} 49 \\ 56 \\ 63 \end{Bmatrix}$
3 times	$\begin{Bmatrix} 3 \\ 4 \\ 5 \\ 6 \\ 7 \\ 8 \\ 9 \end{Bmatrix}$	is	$\begin{Bmatrix} 9 \\ 12 \\ 15 \\ 18 \\ 21 \\ 24 \\ 27 \end{Bmatrix}$	5 times	$\begin{Bmatrix} 5 \\ 6 \\ 7 \\ 8 \\ 9 \end{Bmatrix}$	is	$\begin{Bmatrix} 25 \\ 30 \\ 35 \\ 40 \\ 45 \end{Bmatrix}$	8 times	$\begin{Bmatrix} 8 \\ 9 \end{Bmatrix}$	is	$\begin{Bmatrix} 64 \\ 72 \end{Bmatrix}$
				6 times	$\begin{Bmatrix} 6 \\ 7 \\ 8 \\ 9 \end{Bmatrix}$	is	$\begin{Bmatrix} 36 \\ 42 \\ 48 \\ 54 \end{Bmatrix}$	9 times 9 is 81			
								10 times 10 is 100			

Example 1. I demand how many Shillings there are in 5648l.
 To Answer this, multiply the given Number of Pounds by 20,
 Thus; The first being 0 Cypher, set down 0 underneath the first
 Figure; and then proceed to the next Figure, and say 2 times 8
 is 16; set down 6 under the second Figure and carry 1; then
 2 times 4 is 8, and 1 that I carried makes 9; then 2 times 6 is
 12, set down 2, and carry 1; lastly, 2 times 5 is 10, and 1 that I carried
 makes 11. So that 5648l. multiplied by 20, makes 112960 Shillings.

Ex. 2. In 276 Degrees how many Minutes?

First set down 276
 Then (because 60 Minutes make a Degree) multiply by 60
 The Product is 16560
 So that I find 276 Degrees multiplied by 60, makes 16560 Minutes.

Ex. 3. Multiply 8765437
 By 32

17530874
26296311
 Product 280493984

Multiply 47632867
 By 4352

95265734
238164335
142898601
190531468
207298237184

DIVISION.

Division is that which serves instead of many *Subtractions*, and is
 useful in reducing all Numbers of a lesser Denomination into a greater;
 as Minutes into Degrees, Farthings into Pence, Pence into Shillings, and
 Shillings into Pounds. It consists of Three Parts, (*viz.*) *Dividend* or the
 Num.

Division.

Number to be divided ; the Divisor, or the Number to divide by ; and the Quotient ; also if any Number remain, it is called the Remainder.

Example 1. To divide 7834 by 23; first say, how many times 2 in 7; Or how often 23 in 78, the Answer will be 3 times, which place in the Quotient; then multiply the Divisor 23 by 3, the Figure placed in the Quotient, saying 3 times 3 is 9, and 3 times 2 is 6, place these under the two first Figures of the Dividend, and draw a Line; subtracting 69 from 78, there refts 9, which set underneath, and place a Point under 3, to shew that it is brought down; place it to the 9, then proceed, saying, how many times 23 in 93, or how many times 2 in 9, which will be 4 times; place 4 in the Quotient, by which multiply the Divisor: Again, placing the Product which is 92 under 93, draw a Line and subtract it therefrom, the Remainder 1 put under the Line, and set down 4 the last Figure in the Dividend, putting a Point under it, and place it to the Remainder 1; then because there remains but 14, being less than the Divisor 23, and so cannot be taken out of it, place a Cypher in the Quotient, and the Work is finished.

<i>Divis.</i>	<i>Divid.</i>	<i>Quot.</i>
23)	7834	(340
	69 ..	
	93	
	92	
	14	Rem.

Example 2. In 360 Minutes how many Degrees? | *Divif. Divid. Quot.*
 Here I divide by 60, because 60 Minutes make a De- | 6|0 36|0 (6
 gree, and because the laſt Figure of the Diviſor is a | 36
 Cypher, I cut it off, and with it the laſt Figure of the | 00
 Dividend, which is here alſo a Cypher, and divide 36 by 6, (which is the
 ſame Thing as to divide 360 by 60) but becauſe 6 cannot be taken out of 3,
 therefore I ſay, how many times 6 is 36? The anſwer is 6 times: Which
 I place in the Quotient, and proceed to multiply the Diviſor 6, by the 6
 placed in the Quotient, which produceth 36, which ſubtracted leaves 0; ſo
 that by this Work it appears, that in 360 Minutes there are 6 Degrees juſt.

Example. 3. A Ship taken by 253 Men, is valued at 59875 £ . I demand each Man's Share, being equally divided?

Divisor.	Dividend.	Quotient.	
253)	59875	(236	
	<u>506</u>		<u>253</u>
	927		236
	<u>759</u>		<u>1518</u>
	1685		759
	<u>1518</u>		<u>506</u>
	167 Remains		167
			<u>Proof 59875</u>

First, say, how many times 2 in 5? The answer is two times, which place in the Quotient; then multiply the Divisor 253 by 2, the Figure placed in the Quotient, saying 2 times 3 is 6, 2 times 5 is 10, set down 0, and carry 1; 2 times 2 is 4, and 1 is 5, which set down under the 3 first Figure

Figures of the *Dividend*, from whence being subtracted, set the Remainder underneath, which will be 92, then take down 7, making a Point underneath, and set it after 92, the Remainder; then say, how often 2 in 9? Answer 3 times (for 4 will prove too many.) Then multiply the *Divisor* 253, as before, by 3, the Figure last placed in the Quotient, and the Product will be 759, which being subtracted from the Figures above, the Remainder will be 168, then take down 5, and point it as before, setting it after 168, the last Remainder: And again, ask the Question how often 2 is contained in 16? Answer 6 times; by which 6, which set in the Quotient, multiply the *Divisor* 253; and the Product is 1518, which place under the last *Dividend*, and subtract therefrom, there will remain 167. So there being no more Figures to bring down, the Work is finished, each Man's Share being 236 *l.* and 167 *l.* over, which is to be divided among them; which may easily be done by multiplying 167 by 240, and dividing the Product by 253, give each Man's Share in Pence. The Proof is by multiplying 253 the *Divisor* by 236 the *Quotient*; then taking in 167 the Remainder, under the 3 last Figures, the Product will make the same with the *Dividend*, as you see in the Operation.

The Rule of THREE,

IS that which having three Numbers given, a fourth Number is found in Proportion thereunto; which is done by multiplying the 2d and 3d Numbers together, and dividing that Product by the first, and the Quotient of the said Division is the Answer to the Question.

Example 1. If in 24 Hours a Ship sails 130 Miles; how many Miles will she sail with the same Gale in 192 Hours or eight Days;

Hours	Miles	Hours
24	130	192
		130
		5760
		192
		24960

24)24960(1040 Miles in 192 Hours

24...

96

96

00

1040 Miles in 192 Hours

Here 24 is the first Number, 130 the second, 192 the third; wherefore according to the Rule, I multiply 130 and 192 the second and third Numbers together, and divide the Product thereof 24960, by 24 the first Number, which gives in the Quotient 1040 Miles, which is the Way the Ship will make in 192 Hours, the Time proposed.

Example 2. If 1 lb. of Tobacco cost 6d. what will 112 lb. cost?

$$\begin{array}{r}
 112 \\
 \times 6 \\
 \hline
 672
 \end{array}$$

12)672 Pence (or 56 Shillings.)

Here the first Number being an Unit, which neither multiplies nor divides, it saves the Labour of Division; and the Answer is 672 *d.* for the Answer

The Rule of THREE.

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Answer will be of the same Name with the second Number, which divided by 12 to bring them into Shillings, gives the Quotient 56 s. which is the Price of 112 lb. as required.

Example 3. If a Staff of 3 Yards long, give a Shadow of 2 Yards: How high is that Castle whose Shadow is 100 Feet?

Which Question for the more ready Solution, state thus:

If 6 Feet (which is two Yards) give 9 Feet, what will 100 Feet give?

By the Operation it appears the said Castle must be 150 Feet high.

$$\begin{array}{r} 9 \\ 6 \overline{) 900} \text{ (150 Feet)} \\ \underline{6} \\ 30 \\ \underline{30} \\ 00 \end{array}$$

Example 4. If 564 l. 12 s. 6 d. is to be divided amongst 165 Men, how much is one Man's Share.

First, Reduce it all into Pence, by multiplying 564 by 20 (the Shillings in one Pound) taking in the 12 Shillings as you are taught in Multiplication, and the Sum 11292, multiply by 12 (the Pence in one Shilling) and add the 6 Pence, the Sum 135510 is the Pence in 564 l. 12 s. 6 d. Then say,

If 165 Men have 135510 Pence, how many shall one Man have? And here you should multiply 135510 by the last Number, but in this Case it is 1, which will neither multiply nor divide, therefore you only divide 135510 the Sum of Pence, by 165 the Number of Men, and the Quotient 821 is the Pence for each Man's Share, which divided by 12 (the Pence in one Shilling) gives 68 Shillings, and the 5 Remaining are 5 Pence to each Man's Share.

Note, The 45 Remaining of the first Division is only $\frac{45}{165}$ of one Penny, which is little more than a Farthing.

The Operation follows.

$$\begin{array}{r} 564 \text{ l. } 12 \text{ s. } 6 \text{ d.} \\ \underline{20} \\ 11292 \\ \underline{12} \\ 22590 \\ 11292 \\ \hline 165 \overline{) 135510} \text{ (821 Pence)} \\ \underline{132000} \\ 3510 \\ \underline{33000} \\ 2100 \\ \underline{16500} \\ 450 \end{array}$$

$$\begin{array}{r} 12 \overline{) 821} \text{ (68 Shillings, equal} \\ \underline{720} \text{ to 3 l. 8 s. 5 d.} \\ 101 \\ \underline{96} \\ 5 \end{array}$$

B 2

Note

Note, That in the *Rule of Three*, the first and third Numbers must be both of one Denomination, and the second must be brought into the lowest Value expressed therein; as in the foregoing Example, I work not the Question as it was first stated, but transposing the Numbers, I put the Denomination of Men first and last, and the Money in the Midst, to answer to that Part of the Rule, which requires the first and third Numbers to be both of one Name. The Answer whereof in the preceeding Question, as by the Operation appears, is 821 Pence; which reduced into Shillings, is 68 s. and 5 d, or 3 l. 8 s. 5 d. one Man's Share, as was required.

The next thing I shall briefly treat of is, *The Extraction of the Square and Cube Roots*, as also somewhat of their Use.

The Extraction of the Square Root.

Ex. 1. **T**O Extract the Square Root of 7056 proceed thus: First, Point the given Number (that is, put a Prick over every other Figure, beginning at the first Figure at the Right-hand) and note by the Way, that so many Points as the said Number admits over it, of so many Figures consists the Root of the said Number; then proceed, seeking the greatest Square Number (which is a Number multiplied by itself) in the first Point towards the Left-hand (70) which is 64, constituted of 8 multiplied into itself; for 8 times 8 is 64. The Root of the Square Number which is 8, place in the Quotient, and subscribe the Square Number (64) under the said first Point, subtracting it therefrom, and setting down the Remainder (6) underneath: To this Remainder bring down the next Point (56) then drawing a crooked Line on the Left-hand of the Dividend (656) double the Quotient, and place (*viz.* 16.) therein calling it the Divisor, seek how often the Divisor is contained in all the Figures of the Dividend, save the last to the Right-hand: (*viz.*) How many times 16 in 65? The answer is 4 times, which place in the Quotient, and also on the Right-hand of the Divisor (16) then multiply the Divisor (164) by the 4 last placed in the Quotient, and put the Product, which is 656, under the Dividend, subtracting it therefrom; which done, nothing remains: So that the Square Root of 7056 is 84.

$$\begin{array}{r}
 \cdot \cdot \\
 7056 \text{ (84 Root,} \\
 \quad 64 \\
 \hline
 164 \overline{) 656} \text{ Divisor,} \\
 \quad 656 \\
 \hline
 000
 \end{array}$$

The Square Root is applied to Navigation as follows:

Any two Sides of a Right-angled Plane Triangle being given, the third is found by the Extraction of the Square Root.

Example 2. Suppose a Ship hath made 87 Miles Difference of Latitude, and 71 Miles Departure, and the Distance to be required, the said Distance is found by the Extraction of the Square Root, as follows:

The Rule. Square the Difference of Latitude and Departure severally (that is, multiply each by itself) add these two Squares together, and extract the Square Root of this Sum, which will be the Distance required.

Example

The Extraction of the Square Root.

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Example.

Difference of Lat. 87	The Departure 71	Square Diff. Lat. 7569
Multiplied by itself 87	Multipl. by itself 71	Square Departure 5041
<u>609</u>	<u>71</u>	their Sum 12610
696	497	

The Square = 7569

The Square = 5041

12610 (112 the Distance req.

By the Operation it appears, that the Distance, omitting the Fraction, is 112 Miles,

1
21)26
21
222)510
444
66

Example 2. Suppose a Ship's Distance to be 111 Miles, her Departure 57 Miles, and the Difference of Latitude to be required; the said Difference of Latitude is found by the Extraction of the Square Root, as follows.

The Rule. From the Square of the Distance subtract the Square of the Departure, and the Square Root of the Remainder will be the Difference of Latitude required.

Example. The Distance ——— 111
Multiplied by itself ——— 111
111
111
111

The Departure = 57
Multiplied by itself = 57
399
285
Sq. of Departure = 3249

Square of the Distance ——— 12321
Square of Dep. subtract ——— 3249
Remains — 9072

9072 (95 Diff. Lat. required
81
185)972
925

The Difference of Latitude, as by the Operation appears, is 95 Miles, omitting Fractions.

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If the Departure be required, the Rule is, from the Square of the Distance, subtract the Square of the Difference of Latitude, and the Square Root of the Remainder is the Departure required. The Operation for Brevity-sake is omitted.

Having proceeded thus far in shewing the *Practitioner* how to find the Distance, Difference of Latitude and Departure (any two of them being given, without Trigonometry) I shall shew the Manner of finding the Course exact enough for common Use, without the said Operation, which is done as follows.

The Proportion to find the Course; As the Sum of the Hypotenuse (or Distance) and half the greater of the other two Legs (*viz.*) if the Difference of

14 *The Use of the Extraction of the Square Root.*

of Latitude be most, half that, but if the Departure be most, half that ; I say ; As the Sum of these two, is in Proportion to the lesser (or remaining) Leg ; so is 86, to the Angle (in Degrees) opposite to the less Leg ; which is the Course, when the Departure is less than the Difference of Latitude, otherwise 'tis the Complement of the Course.

Example. Admit a Ship's Distance to be 110 ; the Difference of Latitude to be 88, and the Departure 66, and the Course required.

First, Add the Distance, and half the greater Leg into one Sum.

The Distance is ————— 110

Half the greater Leg (88) is ————— 44

The Sum ————— 154

Having thus done, say, by the Rule of THREE.

As the said Sum 154, is to 66 the lesser Leg ; so is 86, to the Course.

To bring out the odd Minutes, multiply the Remainder of the Division 132 by 60, (the Number of Min. contained in a Degree) and divide the Product by the Divisor (154) and the Quotient of the said *Division* gives for the Answer 51 Minutes : So that the Course required is 36 deg. 51 min.

$$\begin{array}{r}
 66 \\
 \hline
 516 \\
 516 \\
 \hline
 154 \overline{) 5676} (36 \text{ deg. } 51 \text{ min.} \\
 \underline{462} \\
 1056 \\
 \underline{924} \\
 132 \\
 \hline
 \overline{) 7920} (51 \\
 \underline{770} \\
 \underline{220}
 \end{array}$$

Example 3. Extraction of the Square Root. Suppose a Rope 5 Inches Compass, and another Rope of double the Strength is required. The Dimensions of the said required Rope are found by the *Extraction of the Square Root* : For should it be supposed that a Rope of 10 Inches Compass, is but double the Strength of a Rope of 5 Inches ; upon Proof it is manifestly false, for the said Rope of 10 Inches is 4 times the Strength of that of 5.

The Rule. Take the Compass of the given Rope, (*viz.* 5.) and multiply that by itself ; which Product (because the other Rope is to be twice as strong, multiply by 2, and the Square Root of the Product is the Compass of the Rope required.

Example. The given Ropes Compass 5 Inches. Extract the Root 50(7
Multiplied by itself ————— 5
The Square ————— 25
Multiplied by ————— 2

So by this Operation it appears that a Rope must be 7 Inches and a little better, to be twice the Strength of the given Rope of 5 Inches Compass.

If it's desired to know the Weight of one Rope by another, 'tis as follows.

The Proportion is, As the Square of the Compass of the one Rope is to the Square of the Compass of the other ; so is the Weight of the one to the Weight of the other, Length for Length. *Ex.* Suppose a Cable of 10 Inch. to weigh 25 Hundred, and the Weight of a Cable of 8 Inches required. Say,

Extraction of the Cube Root.

15

as 100 (the Square of 10) is to 64 the Square of 8 : So is 25 C. the Weight of one Cable to 16 C. the Weight of the other required.

Extraction of the Cube Root.

I Shall first, as necessary, insert a Table of the Cubes of the Nine Digits, which ought to be committed to Memory.

<i>Cube of the Nine Digits.</i>	$\left\{ \begin{array}{l} 1 \text{ --- } 001 \\ 2 \text{ --- } 008 \\ 3 \text{ --- } 027 \end{array} \right\} \left\{ \begin{array}{l} 4 \text{ --- } 064 \\ 5 \text{ --- } 125 \\ 6 \text{ --- } 216 \end{array} \right\} \left\{ \begin{array}{l} 7 \text{ --- } 343 \\ 8 \text{ --- } 512 \\ 9 \text{ --- } 729 \end{array} \right\}$
---------------------------------	--

Example 1. Extract the Cube Root of 12167.

First, Point the given Number, (*i. e.*) put a Prick over every third Figure (beginning at the Right-hand) then seek the greatest Cube in the first Point, (*viz.* 12) which is 8, the Cube Root whereof (which is 2) place in the Quotient; subtract the Cube (8) from the first Point (12) place the Remainder underneath; to this Remainder bring down the next Point (167) and call this the Resolvend, then draw a Line underneath it, then square the Quotient 2, which is 4; multiply the said Square (4) by 300, which makes 1200; place this under the Resolvend, and call it the Triple Square. Again, multiply the Quotient (2) by 30, which makes 60; place this under the Triple Square, and call it the Triple Quotient; add these two (*viz.*) Triple Square and Triple Quotient into one Sum, and call it the Divisor; seek how often this Divisor is contained in the Resolvend, which is three times; which 3 placed in the Quotient, multiply the Triple Square by the Figure 3 last placed in the Quotient, and subscribe the Product underneath the Divisor; square the said Figure (3) last placed in the Quotient, and thereby multiply the Triple Quotient, and place it underneath the last Product; Cube the Figure (3) last placed in the Quotient, and place it under the preceding Product. Lastly, add these three Products into one Sum, subtracting the said Sum from the Resolvend, subscribe the Remainder; to which Remainder, had there been any more Figures, the next Point must have been brought down, and the preceding Work repeated from the squaring of the Quotient, until all the Figures are so brought down; but in this Example there being no more Figures, the Work is done, and by the Operation the Cube Root of 12167 appears to be 23, nothing remaining.

12167	(23 Root
8	
4167	Resolvend
1200	Triple Square
60	Triple Quot.
1260	Divisor
3600	
540	
27	
4167	
000	

Example 2. Applied, Suppose a Ship of 300 Tun, 75 Feet by the Keel, 29 Feet and an half by the Beam, and 14 Feet Depth in the Hold; another Ship is desired of the same Mould and Shape of 500 Tuns; the several Dimensions of the Ship are found by the Extraction of the Cube Root.

Example. Beginning with the Keel. First, Cube the Length of the given Keel, which is done by multiplying it into itself, and then multiplying the Product by it again.

Then

16 *The Use of the Extraction of the Cube-Root.*

Then say by the Rule of Three: As 300 Tuns the one Ship's Burthen, to 500 Tuns the other Ship's Burthen; so is 421875 the Cube of one Ship's Keel's Length, to the Cube of the other Keel's Length; Which being wrought by the Rule of Three, gives 703125: From which extract the Cube Root, and that will be the Length of the Keel required.

In this Extraction three Cyphers are added to bring out the Fraction, the Work therewith being the same as if there had been more Figures in the proposed Number; the Operation gives for the Length of the Keel required 88 Foot $\frac{9}{10}$ Parts.

Thus, having found one of the Dimensions, the rest may be found without the Extraction of the Root, by the Rule of Three.

Thus, suppose the next Thing I would find be her Breadth by the Beam, say, as the Length of the one Ship's Keel 75, is to the Length of the other 89 *fere*; so 29 $\frac{1}{2}$ Feet the Breadth of the one Ship by the Beam, to the Breadth of the other, which by the Rule of Three, gives 35 Feet. In the same manner you may find the Depth in the Hold, &c.

Example 3. Suppose an Iron Shot 4 Inches Diameter to weigh 9 lb. and the Diameter of a Shot of any other Weight, suppose of 72lb. required. This is also done by the Extraction of the Cube Root, as follows:

First, say, by the Rule of Three.

As 9lb. the Weight of one Shot, to 72lb. the Weight of the other; so is 64 the Cube of the one Shot's Diameter, to the Cube of the other Shot's Diameter, which by the Operation is 512, the Cube Root of which is 8, the Diameter of the Shot required.

But if it was required to find the Weight of a Shot by the Diameter, 'tis done thus, by the Rule of Three.

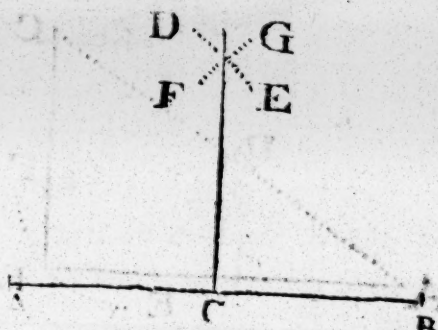
As the Cube of one Shot's Diameter to the Cube of the other; so is the Weight of the one Shot, to the Weight of the other required?

And thus much for the *Arithmetical Part* of this Treatise.

75 given Keel	
75	
375	
525	
5625	
75	
28125	
39375	
421875 Cube given Keel	
703125 (88 $\frac{9}{10}$ Root	
512	
191125 Resolvend	
19200 Triple Square	
240 Triple Quotient	
19440 Divisor	
153600	
15360	
512	
169472	
21653000 Resolvend	
2323200 Triple sq.	
2640 Trip Quot.	
2325840 Divisor	
20908800	
213840	
729	
21123369	
520631 Remainder	

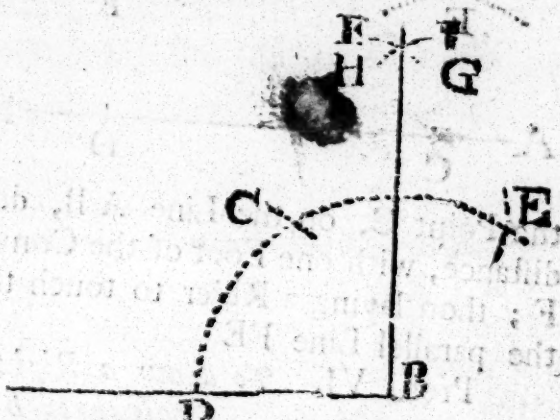
Prob. I. To raise a Perpendicular from any Point proposed, in a given Right Line.

LET the Line given be AB , and the Perpendicular to be raised from the Point C ; to do which set off the two equal Distances CA and CB . Then the Compasses being opened to any convenient Distance bigger than AC or CB , with one Foot of the Compasses in the Point A , describe the Arch DE ; then with the same Extent, and one Foot in the Point B , describe the Arch FG , then draw the Perpendicular from the Point C , thro' the Intersection, (or cutting) of the two Arches FG and DE , which was required.



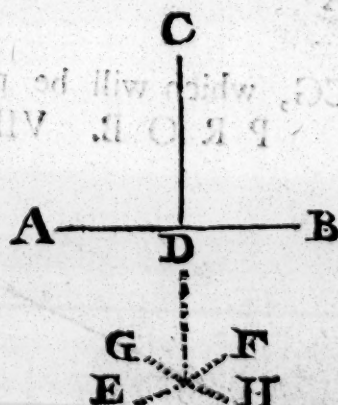
Prob. II. To raise a Perpendicular on the End of a Line.

Let the Line given be AB , the Perpendicular to be raised from the Point B ; to do which, with one Foot of the Compasses at B , with any convenient Distance, as BD , sweep an Arch; then with the same Extent, one Foot of the Compasses being in the Point D , mark the said Arch at the Point C , and one Foot being at C , mark it at E , then with the same Distance, one Foot of the Compasses being in the Point C , describe the Arch FG ; and placing the Compasses in the Point E , describe the Arch HI ; then from the Point B , and through the Intersection of the two Arches FG and HI , draw the Perpendicular which was required.



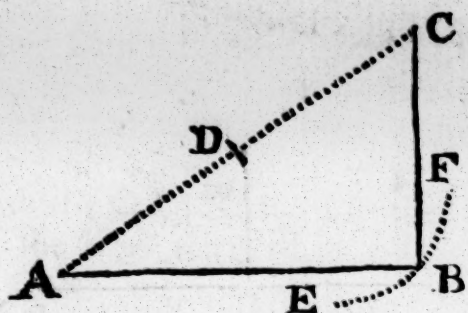
Prob. III. To let fall a Perpendicular from a Point assigned, over a given Right Line.

Let AB be the Line given, C the Point over the Line from which the Perpendicular is to fall; to do which, place one Foot of the Compasses in the Point C , then opening them to a convenient Extent, mark the Line AB in two Points with the said Distance, as in the Points A and B ; then with one Foot of the Compasses in the Point A , describe the Arch EF , and with one Foot in the Point B , describe the Arch GH ; then from the Point C , and through the Intersection of the said two Arches, draw the Perpendicular CD , which was required.



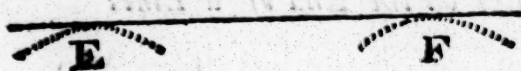
Prob.

Prob. IV. *Another way to let fall a Perpendicular from a given Point, on a given Right Line.*



Let the Line given be AB, upon which it is required to let fall a Perpendicular from the Point C; to do which, from the Point assigned C, draw the Line CA; which Line divide into two equal Parts, as in the Point D; then one Point of the Compasses resting in the Point D, with the same distance, (*viz.* of half the Line AC) describe the Arch EF: Then from the Point C, to the Intersection of the Arch EF with the Line AB, draw the Perpendicular CB.

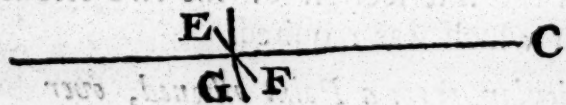
Prob. V. *To draw a Line parallel to a Line given.*



Let AB be a Line given, to which it is required to draw a Line parallel, to do which, first take in the Compasses the distance at which the parallel Line is to be drawn, and then setting one Foot of the Compasses in the Point C, on the Line AB, describe the Arch E; and with the same distance, with one Foot of the Compasses in the Point D, describe the Arch F; then laying a Ruler to touch the Convexity of the two Arches, draw the parallel Line FE.

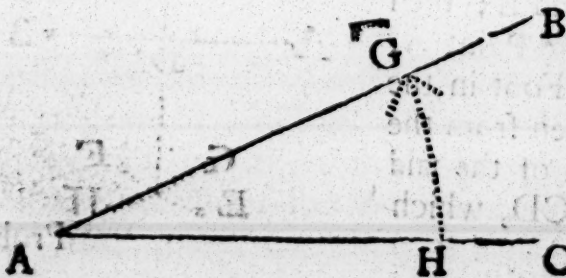
Prob. VI. *To draw a Right Line Parallel to a given one, that shall pass through a Point given.*

Suppose AB the given Line, and it's required to draw a Line Parallel thereto, that shall pass thro' a given Point, as C.



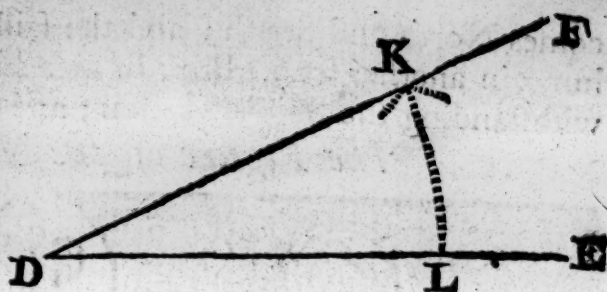
Set one Foot of the Compasses in C, with the other at any distance, cross AB in D, and with that distance from any Point as A; in the Line AB describe the Arch EF; then from C with the distance AD cross the Arch EF in G, and draw the Line CG, which will be parallel to the given Line AB, as was required.

P R O B. VII. *To make an Angle equal to any Angle given.*



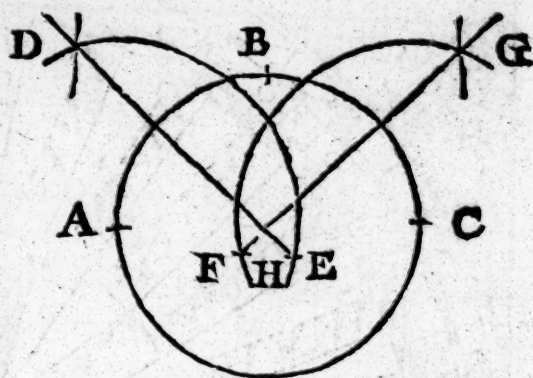
Suppose BAC an Angle given, and it is required to make another Angle equal thereto: To do this, first draw the Line DE, then with any convenient Distance less than AC, describe the Arch GH, then placing the Compasses at D, with the same Distance which swept the Arch

Arch GH sweep the Arch KL; take the Arch GH in the Compasses, and setting one Foot in the Point L, cross the Arch LK in the Point K, then through the Point K draw the Line DKF, then is the Angle EDF equal to the Angle BAC, as was required.



Prob. VIII. To bring any three Points not situate in a Right Line, into the Circumference of a Circle.

Let the three Points thro' which the Circle is to pass be A, B, C: Take above half the Distance between the two Points A and B in the Compasses; and one Foot of the Compasses being in the Point A, with the said Distance describe the Arch ED; and with the same Distance, one Foot of the Compasses being in the Point B, mark the Arch ED in the Points E and D, and draw the Right Line ED; then take above half the distance between the Points C and B in the Compasses, and one Foot of the Compasses being in the Point C, with the said Distance describe the Arch FG; and with the same distance, one Foot of the Compasses being in the Point B, mark the Arch FG, in the Points F and G, and draw the Right Line FG. Now where the two Right Lines DE and FG, being continued, intersect each other (*viz.* in the Point H) is the Center of the Circle required.



The Description of the Mariner's Compass.

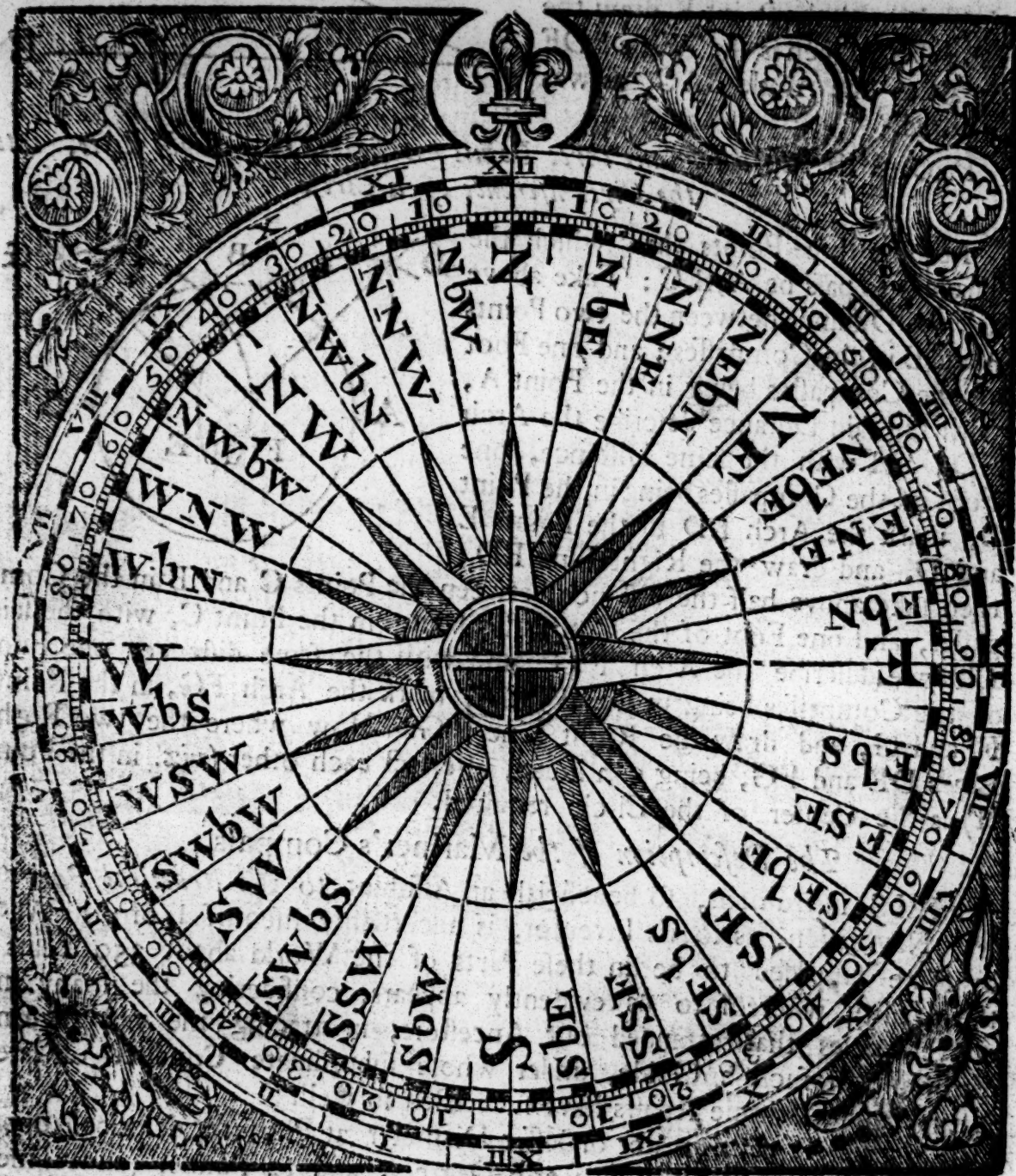
THIS Instrument, so beneficial an Assistant to the *Practical Part* of Navigation, as to its Inventor, is uncertainly discoursed of; its Age, by some supposed to be in these Parts of the World about 350 Years; the Utility whereof to us evidently appears, considering the many Inconveniencies that attended our Ancestors, in tracing the vast Ocean, for want of such a Guide, under whose subordinate Conduct of later Years, our Maritime Affairs have succeeded so well.

It is a Circle of a greater or lesser Diameter at Pleasure, described upon a Paste-board, and divided into 360 Degrees, and 32 Points, (and sometimes into 24 Hours) each Point containing 11 deg. 15 min. or 3 quarters of an Hour; as in the following Figure. The Circle being thus divided upon the Card or Paste-board, there are pasted on the other Side of the said Card or Paste-board, two hardened Wires, or a thin Bar of Steel, which being touched with a Loadstone, and the Card hung at the Center upon a Pin, fix'd in a Box, its Position (Variation excepted) be-

The Mariner's Compass.

comes North and South; and the said Box being cover'd with a Glass, is hung in another square Box, in such Manner that the Card may traverse notwithstanding the Ship's Motion; and being thus fixed, it is ready for Use.

The Figure of the Mariner's Compass.



To find the Prime or Golden Number.
THE Prime or Golden Number, is a Revolution of Nineteen Years, in which Term the Moon returns to make the same Aspects with the Sun on the same Day of the Month (most commonly) that they were on Nineteen Years before.

To find which, add 1 to the Year of our Lord, and divide by 19, the Remainder is the Prime or Golden Number, but if nothing remains, the Prime is 19.

Example

The Gregorian or New Calendar.

21

Example. To find the Golden Number for the Year 1762, add 1, which makes 1763; which divided by 19, the Quotient will be 92, and the Remainder 15, which is the Golden Number for the Year 1762.

N.B. The Golden Number is the same in both the Julian and Gregorian Account of Time.

To find the Epact.

THE Epact is the Number of Days which the Solar Year consisting of 365 Days, exceeds the Lunar (or twelve Revolutions of the Moon to the Sun) containing 354 Days, the Difference being 11 Days. When the Prime is 1, the Epact is 0; when 2, the Epact is 11; when 3, twice 11, or 22; when 4, thrice 11, or 33, or 3, omitting 30, (which must constantly be done when it exceeds 30;) and may be found in the following Manner.

Subtract 1 from the Prime, Multiply the Remainder by 11, and divide that Product (if it exceeds 30) by 30; the Remainder will be the Epact.

Example. Suppose it was to find the Epact for the Year 1762.

The Prime for the Year 1762 is	_____	15
From which subtract	_____	1
The Remainder is	_____	14
Which multiplied by	_____	11
The Product is	_____	154

This Product being divided by 30, the Quotient will be 5, and the Remainder 4, which is the Epact required.

Note; After the Year 1799, there will require a different Method to find the Epact.

To find the Moon's Age.

ADD to the Epact for *March* 1, for *April* 2, for *May* 3, for *June* 4, for *July* 5, for *August* 6, for *September* 8, for *October* 8, for *November* 10, for *December* 10, for *January* 0, for *February* 2.

Having added to the Epact the Number for the Month, according to the Rule foregoing, add thereto the Day of the Month, for which the Moon's Age is required: These three Sums added together, if less than 30, is the Moon's Age; if more than 30, then divide it by 30, the Remainder is the Age of the Moon. The Moon's Age subtracted from 30, leaves the Day of the Change. Again, 15 added to, or subtracted from the Day of the Change, leaves the Day of Full Moon.

Example. Suppose it was required to find the Moon's Age for the first Day of *April*, 1764.

First set down the Epact for that Year	_____	26
To which add the Number for the Month, which is	_____	2
To that add the Day of the Month, which is	_____	1
Sum, gives the Moon's Age	_____	29
Then out of	30	
Take	29	The Moon's Age.
Remains	1	Day to the next Change.
Add	15	
Makes	16	Days to next Full Moon.

T

The Gregorian or New Calendar.

To find the Moon's Southing, and Time of Full-Sea, or High-Water ; The Reader is here refer'd to the Tide-Table, Page 32, &c. and the Use thereof immediately following.

To find the Dominical Letter.

Divide the Year and its fourth Part by 7, the Remainder subtracted from 7 gives the Dominical Letter ; reckoning A for 1, B for 2, C for 3, D for 4, E for 5, F for 6, G for 7.

Suppose it was required to find the Dominical Letter for the Year 17

First, Set down the Year ——— ——— ——— ——— 1762

Then the 4th Part, (the remainder 2 omitted, which denominates }
it to be the Second Year after Leap-Year,) is ——— } 440

The Sum is 2202

This Sum being divided by 7, the Quotient will be 314, and the Remainder 4, which being subtracted from 7, leaves 3; and consequently the Dominical Letter is C: But when it is Leap-Year, there will be two Dominical Letters, and then the Letter thus found serves from the last of *February* to the End of the Year; and the Letter before that, reckoning them backwards from G, is the Sunday Letter for the former part of the Year, to that Time.

N.B. After the Year 1799, the Order of the Dominical Letters, as they now range, will be disturbed, and consequently to find them, another Method must then take Place.

N.B. After the Year 1799, the Order of the Dominical Letters, as they now range, will be disturbed, and consequently to find them, another Method must then take Place.

To find the Cycle of the Sun.

A D D to the Year 9, divide the Sum by 28, the Remainder is the Cycle of the Sun.

Suppose it be required for the Year 1762
Then add _____ 9
Divided by _____ 28) 1771 (63
168
91
84
7

Then add _____ 9

Divided by 28) 1771(63

168 •

• 91

84

• 7

By the Operation it appears that 7 is the Cycle of the Sun for the Year 1762, being the Remainder after the Division.

Note, Hillary Terms begins Jan. 23. and ends Feb. 12.

Easter Term begins 17 Days after *Easter-day*, and ends *Monday* before *Whitsunday*.

Trinity Term begins on Friday after Trinity Sunday, and ends nineteen Days after.

Michaelmas Term begins November 6, and ends November 29.



A Table of the Moon's Age for the Year 1763. 23

Months	D.	H.	Months	D.	H.
January {	Last quart.	6 5 A	July {	Last quart.	3 8 M
	New moon	14 4 M		New moon	10 mid.
	First quart.	22 8 M		First quart.	17 5 A
	Full moon	29 noon		Full moon	24 11 A
February {	Last quart.	5 4 M	August {	Last quart.	2 1 M
	New moon	12 10 A		New moon	9 8 M
	First quart.	21 1 M		First quart.	15 mid.
	Full moon	27 11 A		Full moon	23 1 A
				Last quart.	31 5 A
March {	Last quart.	6 3 A	Septem. {	New moon	7 5 A
	New moon	14 5 A		First quart.	14 8 M
	First quart.	22 4 A		Full moon	22 5 M
	Full moon	29 8 M		Last quart.	30 7 M
April {	Last quart.	5 6 M	October {	New moon	7 1 M
	New moon	13 10 M		First quart.	13 8 A
	First quart.	21 2 M		Full moon	21 10 A
	Full moon	27 4 A		Last quart.	29 6 A
May {	Last quart.	4 10 A	November {	New moon	5 10 M
	New moon	13 1 M		First quart.	12 noon
	First quart.	20 8 M		Full moon	21 4 A
	Full moon	27 1 M		Last quart.	28 5 A
June {	Last quart.	3 3 A	December {	New moon	4 9 A
	New moon	11 2 A		First quart.	12 7 M
	First quart.	28 1 A		Full moon	20 9 M
	Full moon	25 11 M		Last quart.	27 2 A

*Only Two Eclipses this Year, and they are both of the Sun,
and both invisible.*

The first is on the 13th of *April*, at 10 in the Morning.
The second is on the 7th of *October*, at 1 in the Morning.

Months	D.	H.	Months	D.	H.
<i>January</i>	New moon	3 10 M	<i>July</i>	First quart.	6 3 A
	First quart.	11 4 M		Full moon	13 9 M
	Full moon	19 1 M		Last quart.	20 10 A
	Last quart.	25 10 A		New moon	28 9 A
<i>February</i>	New moon	2 1 M	<i>August</i>	First quart.	4 8 A
	Full moon	10 2 M		Full moon	11 6 A
	Last quart.	17 1 A		Last quart.	19 3 A
	First quart.	24 6 M		New moon	27 7 M
<i>March</i>	New moon	2 5 A	<i>September</i>	First quart.	3 1 M
	First quart.	10 10 A		Full moon	10 7 M
	Full moon	17 mid.		Last quart.	18 10 M
	Last quart.	24 3 A		New moon	25 5 A
<i>April</i>	New moon	1 0 M	<i>October</i>	First quart.	2 8 M
	First quart.	9 2 A		Full moon	9 10 A
	Full moon	16 9 M		Last quart.	18 3 M
	Last quart.	24 2 M		New moon	25 2 M
<i>May</i>	New moon	1 3 A		First quart.	31 6 A
	First quart.	9 1 M	<i>November</i>	Full moon	8 4 A
	Full moon	15 5 A		Last quart.	16 7 A
	Last quart.	22 3 A		New moon	23 1 A
	New moon	30 7 A		First quart.	30 8 A
<i>June</i>	First quart.	7 9 M	<i>December</i>	Full moon	8 noon
	Full moon	13 mid.		Last quart.	16 7 M
	Last quart.	21 5 M		New moon	22 11 A
	New moon	29 9 M		First quart.	30 1 M

Four Eclipses this Year, two of the Sun, and two of the Moon.

The first is of the Moon, *March* the 17th, visible 8 digits.

The second is of the Sun, *April* the 1st, visible 10 digits.

The third is of the Moon, *September* the 10th, invisible.

The fourth is of the Sun, *September* the 25th, invisible.

A Table of the Moon's Age for the Year 1765.

25

Months	D.	H.	Months	D.	H.
January {			July {		
Full moon	7	6M	Full moon	2	mid.
Last quart.	14	6 A	Last quart.	9	10 A
New moon	21	11M	New moon	18	2M
First quart.	28	9 A	First quart.	25	4 A
February {			August {		
Full moon	5	11 A	Full moon	1	7M
Last quart.	13	2M	Last quart.	8	1 A
New moon	19	11 A	New moon	16	4 A
First quart.	27	6 A	First quart.	23	11 A
March {			Full moon	30	4 A
Full moon	7	1 A	September {		
Last quart.	14	10M	Last quart.	7	6M
New moon	21	1 A	New moon	15	4M
First quart.	29	3 A	First quart.	22	5M
April {			Full moon	29	3M
Full moon	6	1M	October {		
Last quart.	12	5 A	Last quart.	7	2M
New moon	20	4M	New moon	14	5 A
First quart.	28	8M	First quart.	21	11M
May {			Full moon	28	6 A
Full moon	5	10M	November {		
Last quart.	12	10M	Last quart.	5	9 A
New moon	19	8 A	New moon	13	4M
First quart.	27	10 A	First quart.	19	7 A
June {			Full moon	27	11M
Full moon	3	5 A	December {		
Last quart.	10	10M	Last quart.	5	3 A
New moon	18	11M	New moon	12	3 A
First quart.	26	8M	First quart.	19	6M
			Full moon	27	6M

Six Eclipses this Year, four of the Sun, and two of the Moon.

The first is of the Sun, *February* the 19th, invisible.

The second is of the Moon, *March* the 7th invisible.

The third is of the Sun, *March* the 21st, invisible.

The fourth is of the Sun, *August* the 16th, visible 3 digits.

The fifth is of the Moon, *August* the 30th, invisible.

The sixth is of the Sun, *September* the 15th, invisible.

Months	D.	H.	Months	D.	H.
<i>January</i>	Last quart.	4 8 M	<i>July</i>	New moon	7 2 M
	New moon	11 1 M		First quart.	15 5 M
	First quart.	17 9 A		Full moon	22 1 M
	Full moon	26 1 M		Last quart.	28 5 A
<i>February</i>	Last quart.	2 9 A	<i>August</i>	New moon	5 6 A
	New moon	9 noon		First quart.	13 4 A
	First quart.	16 3 A		Full moon	20 7 M
	Full moon	24 7 A		Last quart.	27 6 M
<i>March</i>	Last quart.	4 7 M	<i>September</i>	New moon	4 9 M
	New moon	10 10 A		First quart.	12 1 M
	First quart.	18 10 M		Full moon	18 3 A
	Full moon	26 11 M		Last quart.	25 0 A
<i>April</i>	Last quart.	2 3 A	<i>October</i>	New moon	4 1 M
	New moon	9 10 M		First quart.	11 3 M
	First quart.	17 5 M		Full moon	18 2 M
	Full moon	24 mid.		Last quart.	25 5 A
<i>May</i>	Last quart.	1 7 A	<i>November</i>	New moon	2 4 A
	New moon	8 11 A		First quart.	9 3 A
	First quart.	16 mid.		Full moon	16 3 A
	Full moon	24 10 M		Last quart.	24 2 A
	Last quart.	31 1 M	<i>December</i>	New moon	2 5 M
<i>June</i>	New moon	7 noon		First quart.	8 11 A
	First quart.	15 4 A		Full moon	16 6 M
	Full moon	22 5 A		Last quart.	24 11 M
	Last quart.	29 8 M		New moon	31 5 A

Four Eclipses this Year, two of the Sun, and two of the Moon.

The first is of the Sun, *February* the 9th, invisible.

The second is of the Moon, *February* the 24th, visible 4 digits.

The third is of the Sun, *August* the 5th, visible 11 digits.

The fourth is of the Moon, *August* the 20th, invisible.

A Table of the Moon's Age for the Year 1767. 27.

Months	D.	H	Months	D.	H.		
January	First quart.	7	8 M	July	First quart.	4	7 M
	Full moon	15	1 M		Full moon	11	4 A
	Last quart.	23	7 M		Last quart.	14	8 M
	New moon	30	3 M		New moon	25	7 A
February	First quart.	5	8 A	August	First quart.	2	11 A
	Full moon	13	7 A		Full moon	10	1 M
	Last quart.	21	9 A		Last quart.	16	3 A
	New moon	28	2 A		New moon	24	9 M
March	First quart.	7	10 M	Septem.	First quart.	1	1 M
	Full moon	15	2 A		Full moon	8	8 M
	Last quart.	23	9 M		Last quart.	15	1 M
	New moon	29	mid.		New moon	23	2 M
April	First quart.	6	3 M	October	First quart.	1	1 M
	Full moon	14	7 M		Full moon	7	5 A
	Last quart.	21	5 A		Last quart.	14	3 A
	New moon	28	9 M		New moon	22	7 A
May	First quart.	5	8 A	November	First quart.	30	11 M
	Full moon	13	9 A		Full moon	6	3 M
	Last quart.	20	1 A		Last quart.	13	9 M
	New moon	27	7 A		New moon	21	1 A
June	First quart.	4	2 A	December	First quart.	28	7 A
	Full moon	12	9 M		Full moon	5	2 A
	Last quart.	19	3 M		Last quart.	13	6 M
	New moon	26	6 M		New moon	21	4 M
				First quart.	28	4 M	

Three Eclipses this Year, two of the Sun, and one of the Moon.

The first is of the Sun, *February* the 9th, invisible.

The second is of the Moon, *July* the 11th, visible.

The third is of the Sun, *July* the 25th, invisible.

Months	D.	H.	Months	D.	H.
January	Full moon	4 4 M	July	Last quart.	7 6 M
	Last quart.	12 4 M		New moon	14 2 M
	New moon	19 6 A		First quart.	21 9 A
	First quart.	26 no on		Full moon	29 2 A
February	Full moon	2 8 A	August	Last quart.	5 11 M
	Last quart.	11 mid.		New moon	12 1 A
	New moon	18 6 M		First quart.	20 3 A
	First quart.	24 9 A		Full moon	28 1 M
March	Full moon	4 2 A	September	Last quart.	3 4 A
	Last quart.	11 6 A		New moon	11 3 M
	New moon	18 4 A		First quart.	9 7 M
	First quart.	25 8 M		Full moon	26 9 M
April	Full moon	2 8 M	October	Last quart.	2 mid.
	Last quart.	10 8 M		New moon	10 8 A
	New moon	17 1 M		First quart.	18 11 A
	First quart.	23 9 A		Full moon	25 6 A
May	Full moon	2 1 M	November	Last quart.	1 no on
	Last quart.	9 6 A		New moon	9 2 A
	New moon	16 9 M		First quart.	17 no on
	First quart.	23 no on		Full moon	24 4 M
	Full moon	31 3 A	December	Last quart.	1 4 M
June	Last quart.	8 1 M		New moon	9 8 M
	New moon	14 5 A		First quart.	16 11 A
	First quart.	22 4 M		Full moon	23 3 A
	Full moon	30 4 M		Last quart.	30 11 A

Six Eclipses this Year, three of the Sun, and three of the Moon.

The first is of the Moon, *January* the 4th, visible.

The second is of the Sun, *January* the 19th, invisible.

The third is of the Moon, *June* the 30th, invisible.

The fourth is of the Sun, *July* the 14th, invisible.

The fifth is of the Sun, *December* the 9th, invisible.

The sixth is of the Moon, *December* the 23d, invisible.

A Table of the Moon's Age for the Year 1769. 29

Months	D.	H.	Months	D.	H.
January {			July {		
New moon	8	1 M	New moon	3	3 A
First quart.	15	9 M	First quart.	10	7 A
Full moon	22	3 M	Full moon	18	10 A
Last quart.	29	8 A	Last quart.	26	7 M
February {			August {		
New moon	6	6 A	New moon	1	11 A
First quart.	13	4 A	First quart.	9	11 M
Full moon	20	5 A	Full moon	17	11 M
Last quart.	28	5 A	Last quart.	24	1 A
			New moon	31	10 M
March {			Septem. {		
New moon	8	6 M	First quart	8	5 M
First quart.	14	mid.	Full moon	15	11 A
Full moon	22	9 M	Last quart.	22	6 A
Last quart.	30	1 A	New moon	29	10 A
April {			October {		
New moon	6	5 A	First quart.	8	1 M
First quart.	13	8 M	Full moon	15	10 M
Full moon	21	1 M	Last quart.	22	1 M
Last quart.	29	5 M	New moon	29	2 A
May {			November {		
New moon	6	1 M	First quart.	6	7 A
First quart.	12	5 A	Full moon	13	8 A
Full moon	20	5 A	Last quart.	20	noon
Last quart.	28	5 A	New moon	28	8 M
June {			December {		
New moon	4	9 M	First quart.	6	noon
First quart.	11	5 M	Full moon	13	6 M
Full moon	19	9 M	Last quart.	20	1 M
Last quart.	27	1 M	New moon	28	3 M

Five Eclipses this Year, three of the Sun, and two of the Moon.

The first is of the Sun, *January* the 8th, invisible.

The second is of the Sun, *June* the 4th, visible 7 digits.

The third is of the Moon, *June* the 19th, invisible.

The fourth is of the Sun, *November* the 28th invisible.

The fifth is of the Moon, *December* the 13th, visible 6 digits.

30 *A Table of the Moon's Age for the Year 1770.*

Months	D.	H.	Months	D.	H.
January {			July {		
First quart	5	1 M	Full moon	7	mid.
Full moon	11	5 A	Last quart.	15	mid.
Last quart.	18	6 A	New moon	22	4 A
New moon	24	10 A	First quart.	29	no on
February {			August {		
First quart.	3	no on	Full moon	6	3 A
Full moon	11	4 M	Last quart.	14	8 M
Last quart.	17	1 A	New moon	20	11 A
New moon	25	4 A	First quart.	28	2 M
March {			Septem. {		
First quart.	4	8 A	Full moon	5	6 M
Full moon	11	4 A	Last quart.	12	3 A
Last quart.	19	9 M	New moon	19	8 M
New moon	27	6 M	First quart.	26	8 A
April {			October {		
First quart.	3	3 M	Full moon	4	8 A
Full moon	10	5 M	Last quart.	11	10 A
Last quart.	18	5 M	New moon	18	8 A
New moon	25	5 A	First quart.	26	4 A
May {			November {		
First quart.	2	10 M	Full moon	3	9 M
Full moon.	9	6 A	Last quart.	10	5 M
Last quart.	17	10 A	New moon	17	10 M
New moon	25	1 M	First quart.	25	1 A
First quart.	31	4 A	December {		
June {			Full moon	2	9 A
Full moon	8	9 M	Last quart.	9	2 A
Last quart.	16	1 A	New moon	17	3 M
New moon	23	9 M	First quart.	25	8 M
First quart.	30	1 M			

There will be two Eclipses this Year, and both of the Sun.

The first is of the Sun, May the 25th, invisible.

The second will be on November the 17th, invisible.

A Table of the Moon's Age for the Year 1771.

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Months	D.	H.	Months	D.	H.
January {	Full moon	1 9 M	July {	Last quart.	5 5 M
	Last quart.	8 1 M		New moon	12 9 M
	New moon	15 10 A		First quart.	18 11 A
	First quart.	24 1 M		Full moon	26 4 A
	Full moon	30 7 A			
Febru. {	Last quart.	6 2 A	August {	Last quart.	3 7 A
	New moon	14 6 A		New moon	10 4 A
	First quart.	22 2 A		First quart.	17 8 M
				Full moon	25 8 M
March {	Full moon	1 6 M	September {	Last quart.	2 7 M
	Last quart.	8 5 M		New moon	9 1 M
	New moon	16 noon		First quart.	15 8 A
	First quart.	24 1 M		Full moon	23 mid.
	Full moon	30 4 A			
April {	Last quart.	7 1 M	October {	Last quart.	1 5 A
	New moon	15 3 M		New moon	7 8 M
	First quart.	22 7 M		First quart.	15 noon
	Full moon	29 2 M		Full moon	23 4 A
				Last quart.	31 12 M
May {	Last quart.	6 8 A	November {	New moon	6 7 A
	New moon	14 3 A		First quart.	14 8 M
	First quart.	21 1 A		Full moon	22 8 M
	Full moon	28 1 A		Last quart.	29 10 M
June {	Last quart.	5 1 A	December {	New moon	6 8 M
	New moon	13 1 M		First quart.	14 5 M
	First quart.	19 5 A		Full moon	21 10 A
	Full moon	27 2 M		Last quart.	28 6 A

Four Eclipses this Year, two of the Sun, and two of the Moon.

The first is of the Moon, *April* the 29th, visible 4 digits.

The second is of the Sun, *May* the 14th, invisible.

The third is of the Moon, *October* the 23d, sets eclipsed.

The fourth is of the Sun, *November* the 6th invisible.

The Use of the foregoing Tables of the Moon's Age.

IN the said Tables the one half Page contains the first six Months of the Year, the other half the following six Months; in the first Column of each half, towards the Left hand are the Months; in the second the New, Full, and Quarters of the Moon; in the two following Columns are the Days and Hours of the said New, Full, and Quarters, either Morning or Afternoon, as the Letters A and M denote, A signifying Afternoon, M Morning: At the Bottom of each Table are the Eclipses for that respective Year.

The Use of the Tables is, readily by Inspection, to find the Day and Hour of the New, Full, or Quarters of the Moon.

Examp. 1. Suppose it was desired to find the Time of New Moon, *Jan.* 1764. First look for the Year 1764 on the Top of the Leaf, which having found, look for *January* in the first Column towards the Left-hand; then in the next Column in the same Month is found New Moon; and in the two following Columns against New Moon stands 3d. 10h. M. which shews that the New-moon in *January* 1764 is the 3d Day at 10 o'Clock in the Morning. The same Directions serve for the Full Moon, or first and last Quarter.

To find the Moon's Age subtract the Day of the Change or New Moon from the Day proposed, the Remainder is the Moon's Age: Suppose therefore it was required to find the Moon's Age for *December 27, 1764.*

Looking in the Year 1764, the Table gives the New Moon for *Dec.* to be on the twenty-second Day, therefore 22 being subtracted from 27, there remains 5, whereby it appears the Moon is 5 Days old on the 27th of *December* in the Year 1764.

Example. Suppose it were required to find the Moon's Age on the 1st of *November, 1765.*

The last New Moon before *Nov. 1st* was *Oct. 14th*, but because you cannot take 14 from 1, you must add 31 (the Number of Days in *Oct.*) and from the Sum 32 subtract 14; The Remainder 18 is the Moon's Age required.

A TIDE-TABLE for the Sea-Coasts of Great-Britain, Ireland, Norway, Holland, Flanders, France, Biscay, &c. Shewing what Moon makes Full Sea, upon the Full and Change Days, at the Places following, rang'd in Alphabetic Order.

A		H	M		H	M
A	T Army NNE. and SSW.	01	30	At Albarwich & Antwerp,	06	00
	At Amsterdam & Arm-			East and West — — — —		
	tiers, NE. and SW. — — —	03	00	At Aldborough, SE. by S.		
	At Abarwark, ENE. and			and NW. by N. — — — —	09	45
	WSW. — — — —	04	30			

The Tide-Table.

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B		H.	M.	Between Guernsey, and the	H.	M.
At <i>Beachy</i> and <i>Blacktail</i> , and before the <i>Race of Blanquet</i> , or <i>Blanchart</i> , N and S. ———		12	00	<i>Caskets</i> , before <i>Cromer</i> , before the <i>Caskets</i> and <i>Guernsey</i> , <i>Seven Clifts</i> , and at <i>Catness</i> , SE. and NW. ———	09	00
Thwart of <i>Beachy</i> in the <i>Of-fing</i> , N by E. and S by W. —		00	45	At the <i>Caskets</i> , and at <i>Chamberness</i> , SE by S. & NW by N. —	09	45
At <i>Blackness</i> , in <i>Bluet</i> , at <i>Bell-Ile</i> , NNE. and SSW. ———		01	30	At <i>Cows</i> , in the <i>Foss of Caen</i> , in <i>Calais-Road</i> , and in <i>Chamberness-Road</i> , SSE and NNW. —	10	30
Without <i>Bluet</i> , and at <i>Berwick</i> , NE by N. & SW by S. —		02	15	Before the Haven of <i>Caen</i> , in the <i>Chamber</i> , between <i>Cripplesand</i> and the <i>Creyl</i> , and at <i>Cal-shot</i> , S by E. and N by W. —	11	15
The River of <i>Bordeaux</i> , the South Coast of <i>Bretagne</i> , the Coast of <i>Biscay</i> , and at <i>Buchaness</i> , NE. and SW. —		03	00	D		
At <i>Brest</i> , before the <i>Base</i> , the River of <i>Bordeaux</i> within the Haven, NE by E. & SW by W. —		03	45	At <i>Dover-Pier</i> , and before <i>Dunkirk</i> , N and S. ———	12	00
In the <i>Breesound</i> , <i>Bloy</i> , <i>Baltimore</i> , ENE. and WSW. —		04	30	At <i>Denbeigh & Downs</i> in the Road, NE by N. & SW by S. —	02	15
Before <i>Bremen</i> , and at <i>Blackney</i> , and in the Channel before <i>Bordeaux</i> , E. and W. ———		06	00	At <i>Dort</i> , NE and SW. —	03	00
At <i>Bristol Key</i> , E by S. and W by N. ———		06	45	At <i>Dungervan</i> , ENE. and WSW. ———	04	30
At <i>Bridgwater</i> , E S E. and W N W. ———		07	30	At <i>Dartmouth</i> , E. and W. —	06	00
At <i>Boulogne-deep</i> , SSE & NNW		10	30	At <i>Dublin</i> , S E by E. and NW by W. ———	08	15
C				At <i>Dunbar</i> , SE. and NW. —	09	00
In <i>Condado</i> , N. and S. ———		12	00	At <i>Dungeness</i> and <i>Dunnofe</i> , SE by S. and NW by N. —	09	45
In the <i>Chamber of Rye</i> , N by E. and S by W. ———		00	45	At <i>Dover</i> , <i>Dieppe</i> , and in the <i>Downs</i> a-shore S S E. and N NW. ———	10	30
Without <i>Calais</i> , at <i>Corpus Christi</i> Point, before and at <i>Campvere</i> , NNE. and SSW. —		01	30	E		
Between <i>Calais</i> and <i>Dover</i> , before <i>Conquet</i> , and at the North Cape, NE. and SW. ———		03	00	At <i>Emden</i> , before the <i>Elb</i> , before the <i>Eyder</i> , and before <i>Enchusan</i> , N. and S. ———	12	00
At <i>Cork</i> , <i>Calais</i> , C. Clear and in the <i>Greek</i> , ENE. and WSW. —		04	30	At <i>Edam</i> , NNE. and SSW. —	01	30
At <i>Caldy</i> , and in the Bay of <i>Carmarthen</i> , E by N & W by S. —		05	15	Before the Eastern & Western <i>Emes</i> , and at <i>Engomonts</i> , SE. and NW. ———	09	00
At <i>Concale</i> , E. and W. ———		06	00	F		
Without the <i>Caskets</i> , in the Channel, SE by S. and NW by W. ———		08	15	On the Coast of <i>Flanders</i> , N. and S. ———	12	00
				At <i>Flushing</i> , N by E. and S by W. ———	00	45
				E Before		

At

Before the <i>Fen</i> , in the Channel, NNE. and SSW. ———	H.	M.	Horn, and at <i>Hampton-Key</i> , N and S. ———	H.	M.
Without <i>Fountny</i> , NE by N. and SW by S. ———	01	30	Under <i>Holy Island</i> , and at <i>Horn</i> , NNE. and SSW. ———	12	00
Without the Banks of <i>Flanders</i> , NE. and SW. ———	02	15	Before <i>Hartlepool</i> , NE. and SW. ———	01	30
At <i>Flamborough</i> and <i>Bridlington</i> , ENE and WSW. ———	03	00	At <i>Huntcliff-foot</i> , NE by E. and SW by W. ———	03	00
At the <i>Forn</i> in <i>Fowey</i> , at <i>Falmouth</i> , E by N. and W by S. ———	04	30	At <i>Humber</i> , E by N. & W by S. ———	03	45
Between <i>Fowey</i> & <i>Falmouth</i> , in the Channel, and at <i>Foulness</i> , E by S. and W by N. ———	05	15	Before <i>Hamborough</i> , at <i>Hull</i> , at the <i>Holms</i> , and before <i>Humber's Mouth</i> , E and W. ———	05	15
Before the Coast of <i>Frize-land</i> and the <i>Fly</i> , ESE. and WNW. ———	06	45	At <i>Harlem</i> , <i>Havre de Grace</i> , and <i>Homehead</i> , SE and NW. ———	06	00
Without the <i>Fly</i> , SE by E. and NW by W. ———	07	30	At <i>St. Helens</i> , at <i>Harwich</i> , and without the Banks of <i>Harwich</i> , SSE. and NNW. ———	09	00
At <i>Frize</i> and <i>Fair-Isle</i> , NW. and SE. ———	08	15	At <i>Harwich</i> within, S by E. and N by W. ———	10	30
At the <i>Frith</i> , and at the <i>South Foreland</i> , SSE. and NNW. ———	09	00	I	11	15
In <i>Fair Isle Roads</i> , and at the <i>North Foreland</i> , S by E. and N by W. ———	10	30	At <i>Jutland Islands</i> , N. and S. ———	12	00
G			On the West Coast of <i>Ireland</i> , NE. and SW. ———	03	00
In the Road of <i>Gibraltar</i> , at <i>Graveling</i> , and before <i>Cherburg</i> , N and S. ———	11	15	In all the Havens of the South Coast of <i>Ireland</i> , E by N. and W by S. ———	05	15
Before <i>Goeree</i> , at <i>Guernsey</i> , and at <i>Gravesend</i> , NNE. and SSW. ———	12	00	K		
At <i>Groin</i> , at <i>Gascoign</i> , and the Coast of <i>Gallicia</i> , NE. and SW. ———	01	30	<i>Kentish Knock</i> , N. and S. ———	12	00
Between <i>Guernsey</i> & <i>Caskets</i> , SE. and NW. ———	02	00	At <i>Kelliers</i> , NE. and SW. ———	03	00
Thwart of <i>Guernsey</i> in the Channel, SE by S. and NW. by N. ———	03	00	At <i>Kingsale</i> , ENE & WSW. ———	04	30
In the <i>Chamber</i> and <i>Goeree-end</i> , S by E. and N by W. ———	04	30	At <i>Kilduyn</i> , ESE & WNW. ———	07	30
H			At <i>Keldive</i> , SE and NW. ———	09	00
Before the <i>Hever</i> , before	09	00	L		
	09	45	At <i>Leith</i> , North and South ———	12	00
	11	15	At <i>Lisbon</i> , NE by N. and SW by S. ———	02	15
			At <i>London</i> , NE and SW. ———	03	00
			Thwart of <i>Lundey</i> , and before <i>Lynn</i> , E by N. and W by S. ———	05	15
			At <i>Lynn Half-Tide</i> , at <i>Lundey</i> , East and West ———	06	00
			At <i>Lynn</i> , E by S. and W by N. ———	06	43
			At		

The Tide-Table.

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H. M.	At the <i>Lizard</i> by the Land, ESE. and WNW. ————	H. M.	Between the <i>Naze</i> and <i>War-</i> <i>head of Lower</i> , S by E & N by W.	H. M.
12 00	At <i>Lambay</i> , SE. by E. and NW by W. ————	07 30	O	11 15
01 30	At <i>Leostaff</i> , and thwart of it without the Banks, SE by S. and NW by N. ————	08 15	At <i>Orkness</i> , NE and SW. —	03 00
03 00	In <i>Leostaff-Road</i> and at <i>Long-</i> <i>sand-head</i> , SSE. and NNW. —	09 45	At <i>Orkney</i> , SE and NW. —	09 00
03 45	M.	10 30	At <i>Orfordness</i> , SE by S. and NW by N. ————	09 45
05 15	Within the <i>Maes</i> , at <i>Maldon</i> , N by E. and S by W. ————	00 45	At <i>Orfordness</i> , without the Banks, and between <i>Orford</i> and <i>Orwell Waves</i> , SSE. & NNW.	10 30
06 00	Before the <i>Maes</i> , NNE. and SSW. ————	01 30	At <i>Orfordness</i> , within the Sands, S by E. and N by W.	11 15
09 00	At the <i>Maes</i> , and before <i>St. Matthew's Point</i> , NE by E. and SW by W. ————	03 45	At <i>Ostend</i> , N and S. ————	12 00
10 30	In <i>Mousehole</i> , at <i>St. Matthew's</i> , and within <i>Mount's-bay</i> , ENE. and WSW. ————	04 30	P	
11 15	In <i>Milford</i> , at <i>Moonless</i> , at <i>St. Maloes</i> , E by N. and W by S.	05 15	At <i>Portsmouth</i> Half-Tide, N by W. and S by E. ————	11 15
12 00	Between <i>Mousehole</i> and <i>Falmouth</i> , and in <i>Milford-Haven</i> , ESE. and WNW. ————	07 30	At the <i>Pens</i> , <i>Porthus</i> , and <i>Poictu</i> , NE and SW. ————	03 00
05 15	In <i>St. Magnes Sound</i> , and at <i>Magnes Castle</i> , SE. by E. and NW by W. ————	08 15	On the Coast of <i>Portugal</i> , NE by E. and SW by W. —	03 45
12 00	At the <i>Isle of Man</i> , SE & NW	09 00	In <i>Plymouth</i> , and before <i>St. Paul's</i> , E by N. and W by S.	05 15
03 00	Before <i>Maregate</i> , S by E. and N by W. ————	11 15	At <i>St. Paul's</i> , in the Haven, E and W. ————	06 00
04 30	N.	12 00	Before <i>Podeffemeck</i> , E by S. and W by N. ————	06 45
07 30	At <i>Newport</i> Half-tide, N & S	00 45	Thwart of <i>Plymouth</i> , ESE. and WNW. ————	07 30
09 00	At the West-end of the <i>Nore</i> , N by E. and S by W. ————	03 00	At the Race of <i>Portland</i> , SE. and NW. ————	09 00
12 00	Before the River of <i>Nantz</i> , NE. and SW. ————	05 15	Q	
02 15	At <i>Newcastle</i> , E by N & W by S.	06 45	At <i>Queenborough</i> , N. and S.	12 00
03 00	Before <i>St. Nicholas</i> , E by S. and W by N. ————	08 15	R	
05 15	At the <i>Needles</i> , at the <i>Isle of Wight</i> , SE by E. & NW by W.	10 30	At <i>Rocheſter</i> , N by E & S by W	00 45
06 00	All the Coast of <i>Normandy</i> , and <i>Picardy</i> , SSE. and NNW.		At <i>Ramkins</i> , NNE. & SSW.	01 30
06 45			At <i>Rotterdam</i> in <i>Robin-Hood's Bay</i> , and from the Race to the <i>Pole-head</i> , NE. and SW. ————	03 00
			At <i>Rouen</i> , and before <i>Rochel</i> , NE by E. and SW by W. —	03 45
			In <i>Ramsey</i> , E by N & W by S.	05 15
			S	
			In the <i>Sleeve</i> , between <i>Uſhant</i> and <i>Scilly</i> , at the <i>Shce</i> , at the	
			E 2 Spits	

<i>Spits, at Southampton, and along the Swin, North and South —</i>	H.	M.	In the <i>Vourd</i> , at the Bay, within <i>Ushant</i> , ENE & WSW.	H.	M.
Upon the Coast of <i>Spain</i> , and in <i>Shetland</i> , NE. and SW. —	12	00	Without <i>Ushant</i> , E and W.	04	30
At <i>Scilly</i> , the Sound, <i>Scarborough</i> & at <i>Staples</i> , NE by E & SW by W	03	00	St. <i>Vallery</i> , quE. & NNW.	06	00
At <i>Seven Isles</i> , without the Haven, in the <i>Broad Sound</i> , ENE. and WSW. —	03	45	W	10	30
At the Mouth of <i>Severn</i> between <i>Scilly</i> & the <i>Lizard</i> , at the <i>Spurn</i> and <i>Stockton</i> , E by N. & W by S.	04	30	At <i>Winchelsea</i> , N by E. and q by W. —	00	45
Without <i>Scilly</i> , in the Channel, and at <i>Salcomb</i> , E. and W.	05	15	At the <i>Weilings</i> , and from the West-end of the <i>Wight</i> , NNE. and SSW. —	01	30
At <i>Sedmouth</i> , and at the <i>Start</i> , E by S. and W by N. —	06	00	Before the <i>Weilings</i> , NE by N. and SW by S. —	02	15
Off the <i>Start</i> in the Channel, ESE. and WNW. —	06	45	At <i>Whitby</i> , NE. and SW.	03	00
Within the <i>Seine</i> , and before <i>Shelbergh</i> , at 7 <i>Clifts</i> , SE & NW.	07	30	In the Sea of <i>Wales</i> , and <i>Severn</i> , ENE. and W _q W. —	04	30
At <i>Shorain</i> , SE by S & NW by N	09	00	In <i>Wales</i> , E by N & W by S.	05	15
At <i>Seine-head</i> , SSE. & NNW.	09	45	At <i>Wells</i> , at <i>Weymouth</i> , and at <i>Waterford</i> , E. and W. —	06	00
T	10	30	At <i>Weymouth Key</i> , E by S. and W by N. —	06	45
Within <i>Tervere</i> , N by E. & S by W. —	00	45	At the <i>Nefs</i> , by <i>Wieringen</i> , at <i>Winterton</i> , ESE. and WNW.	07	30
Before <i>Tervere</i> , before the River of <i>Thames</i> , and at <i>Tinmouth</i> , NNE. and SSW. —	01	30	Thwart of the Isle of <i>Wight</i> , in the Channel, all within the Isle of <i>Wight</i> , between the Isle of <i>Wight</i> , and <i>Beachy</i> , by the shore, SE by E. & NW by W.	08	15
Before the <i>Tees</i> and <i>Tinmouth</i> , before the Bay of <i>Tinmouth</i> , NE. and SW. —	03	00	At the E. end of the <i>Wight</i> , and on <i>Wieringen Flats</i> , SE and NW. —	09	00
At the Cliffs off the <i>Texel</i> , ENE. and WSW. —	04	30	Y		
In <i>Tarbay</i> , and before the <i>Texel</i> , E. and W. —	06	00	Before <i>Yarmouth</i> , NNE. & SSW. —	01	00
In the Road of the <i>Texel</i> , ESE. and WNW. —	07	30	At <i>Youghall</i> , ENE. and W. SW. —	04	30
At <i>Torgen</i> , S E. by S. and NW by N. —	09	45	At <i>Yarmouth</i> , SE by E. and NW by W. —	08	15
U			In <i>Yarmouth Road</i> , in <i>Yarmouth Haven</i> , SSE. & NNW.	10	30
Before <i>Ureck</i> , N. and S.	12	00	Z		
At <i>Ufe</i> , NE. and S.W. —	03	00	On the Coast of <i>Zealand</i> , NNE and SSW. —	01	30
Between <i>Ushant</i> , and the Main, NE by E. & SW by W.	03	45	In the <i>Zurick-sea</i> , NE & SW.	03	00
			T H F		

THE foregoing Table shews the Time of full Sea at the several Places therein contained, upon the Full and Change Days of the Moon, which for more ready Use is put in Alphabetic Order.

Example. Admit the Time of Full Sea at *London*, upon the Full and Change Days, be required.

Look into the Table under the Letter (L) it is found to flow at *London* North East and South West; that is, when it is full Sea at *London*, the Moon will be, as is vulgarly said, upon the North East and South West Points of the Compass, which is four Points, or 3 Hours.

The Use of this, together with the Moon's Southing, to find the Time of Full Sea at any Time, at any of the said Places is shewn below.

To find the Moon's Southing.

To find the Southing of the Moon, multiply the Moon's Age by 4, and divide the Product by 5, the Quotient is the Time of Southing in Hours, and the Remainder is so many 12 min. of an Hour.

Note, If the Moon's Age exceeds 15, reject the said 15, and take the Remainder, with which proceed instead of the Moon's Age, and it gives her Southing in the Morning.

Example. Suppose the Time of the Moon's Southing be required on the 25th of *December*, 1763. The Moon's Age is found to be 21 Days, rejecting 15, the Remainder is 6, which multiplied by 4 makes 24, which divided by 5, gives the Quotient 4 Hours 48 Minutes, which is the Time of the Moon's Southing in the Morning, as was required.

I shall here add a Table of the Moon's Southing to every Day of her Age.

Moon's Age.	Time	
	H.	M.
1	16	0
2	17	1
3	18	2
4	19	3
5	20	4
6	21	4
7	22	5
8	23	6
9	24	7
10	25	8
11	26	8
12	27	9
13	28	10
14	29	11
15	30	12

The Use of the T A B L E.

The first and second Columns shews the Moon's Age, the third the Southing.

Example.

The Moon being 9 Days old and her Southing required.

In the first Columns under the Title Moon's Age stands 9; over against it in the last Column is 7 Hours 12 Minutes, the Time of the Southing required.

Note also, The same Southing serves for 24 Days old which serves for 9 Days, as the Table shews; only observe that if the Moon be under 15 Days old, her Southing is in the Afternoon, but

if above that Age, then in the Morning.

Thus

Thus having got the Moon's Southing, proceed to find the Time of Full Sea, as follows.

Suppose the Moon to be 9 Days old, the Time of Full Sea in the Downs a-shore, is required.

By the foregoing Table it appears that a NNW. and SSE. Moon makes full Sea, which as the said Table shews, is 10 Hours 30 Minutes; to which adding the Moon's Southing at 9 Days old, (*viz.* 7 Hours 12 Minutes) it makes 17 Hours 42 Minutes, or 5 Hours 42 Minutes (rejecting 12 Hours) in the Morning.

But to be more exact, use the following Table and Directions.

Moon's Age.	Time	
	H.	M.
1	16	0
2	17	1
3	18	1
4	19	2
5	20	2
6	21	3
7	22	4
8	23	4
9	24	5
10	25	6
11	26	7
12	27	9
13	28	10
14	29	11
15	30	00

Having found the Time of Full Sea, upon the Full and Change Days, by the preceding Table for that Purpose, enter this Table with the Moon's Age: Against which in the last Column are the Hours and Minutes to be added for the Time of Full Sea desired.

Example.

Suppose as before, the Moon being 9 Days old, and the Time of Full Sea in the Downs a-shore is required.

A NNW. and SSE. Moon makes full Sea upon the Full and Change Days, which is 10 Hours 30 Minutes, this found enter the opposite Table with the Moon's Age 9 Days, against which stands 5 hours 50 min. which added to 10 hours 30 min. makes 16 hours 20 min. or 4 hours 20 min. (rejecting 12 hours) in the Morning.

Here follows

A New and Exact CALENDAR

O F

The Golden Number, Epact and Moveable Feasts, until the Year 1787; as also of the Sun's Place and Declination to every Day of the Year, for the First, Second Third, and Leap-Year, calculated for, and from the Year 1762, and made to serve (without any considerable Error) till the Year 1777. Likewise the Sun's Rising, whereby may be found the Time of the Setting, and Length of the Day and Night; together with the Southing of the principal fixed Stars at Midnight.

A

A T A B L E of the Dominical-Letters, Cycle of the Sun, Prime, Epact, and Moveable Feasts, for 26 Years to come.

Years.	Dom. Letter	Cycle of ☉	Prime	Epact	Shrove-Sunday.	Easter-Sunday.	Whit-Sunday.
1762	C	7	15	4	February 21	April 11	May 30
1763	B	8	16	15	13	3	22
1764	A G	9	17	26	March 4	22	June 10
1765	F	10	18	7	February 17	7	May 26
1766	E	11	19	18	9	March 30	18
1767	D	12	1	0	March 1	April 19	June 7
1768	C B	13	2	11	February 14	3	May 22
1769	A	14	3	22	5	March 26	14
1770	G	15	4	3	25	April 15	June 3
1771	F	16	5	14	10	March 31	May 19
1772	E D	17	6	25	March 1	April 19	June 7
1773	C	18	7	6	February 21	11	May 30
1774	B	19	8	17	13	3	22
1775	A	20	9	28	26	16	June 4
1776	G F	21	10	9	18	7	May 26
1777	E	22	11	20	9	March 30	18
1778	D	23	12	1	March 1	April 19	June 7
1779	C	24	13	12	February 14	4	May 23
1780	B A	25	14	23	6	March 26	14
1781	G	26	15	4	25	April 15	June 3
1782	F	27	16	15	10	March 31	May 19
1783	E	28	17	26	March 2	April 20	June 8
1784	D C	1	18	7	February 22	11	May 30
1785	B	2	19	18	6	March 27	15
1786	A	3	1	0	26	April 16	June 4
1787	G	4	2	11	18	8	May 27

Month Days	Week Days	Remarkable days, and southing of Stars at Midnight	Second Year 1762 1770		Year 1766 1774		Third Year 1763 1771		Year 1767 1775		Leap Year 1764 1772		Year 1768 1776		First Year 1765 1773		Year 1769 1777	
			☉ pla		☉ dec		☉ pla		☉ dec		☉ pla		☉ dec		☉ pla		☉ dec	
			D	M	D	M	D	M	D	M	D	M	D	M	D	M	D	M
			☿		South		☿		South		☿		South		☿		South	
1	A	Circumfion.	11	11	23	02	10	56	23	02	10	41	23	03	11	26	22	59
2	B	Sun r. 8. 5.	12	12	22	56	11	57	22	57	11	42	22	57	12	27	22	54
3	C		13	13	22	50	12	58	22	51	12	44	22	51	13	28	22	48
4	D		14	14	22	43	13	59	22	45	13	45	22	45	14	29	22	42
5	E		15	15	22	36	15	01	22	38	14	46	22	39	15	30	22	35
6	F	Epiphany.	16	17	22	29	16	02	22	31	15	47	22	33	16	31	22	27
7	G		17	18	22	21	17	03	22	23	16	48	22	26	17	33	22	19
8	A	Castor & Polux	18	19	22	13	18	04	22	15	17	49	22	18	18	34	22	11
9	B	Procyon.	19	20	22	05	19	05	22	07	18	51	22	10	19	35	22	03
10	C		20	21	21	56	20	06	21	59	19	52	22	01	20	36	21	54
11	D	Sun r. 7. 56.	21	22	21	47	21	07	21	50	20	53	22	52	21	37	21	45
12	E		22	23	21	37	22	08	21	40	21	54	21	42	22	38	21	35
13	F		23	25	21	27	23	10	21	30	22	55	21	32	23	39	21	25
14	G		24	26	21	16	24	11	21	19	23	56	21	22	24	40	21	15
15	A		25	27	21	05	25	12	21	08	24	57	21	11	25	41	21	05
16	B		26	28	20	54	26	13	20	57	25	58	21	00	26	43	20	54
17	C		27	29	20	42	27	14	20	45	26	59	20	48	27	44	20	42
18	D		28	30	20	30	28	15	20	33	28	00	20	36	28	45	20	29
19	E		29	31	20	18	29	16	20	20	29	02	20	23	29	46	20	16
20	F	Sol in Aqua.	☿	32	20	05	☿	17	20	07	☿	03	20	10	☿	47	20	02
21	G		01	33	19	51	01	18	19	54	01	04	19	57	01	48	19	48
22	A	Sun r. 7. 44.	02	34	19	37	02	20	19	40	02	05	19	44	02	49	19	34
23	B		03	35	19	23	03	21	19	26	03	06	19	30	03	50	19	20
24	C		04	36	19	09	04	22	19	12	04	07	19	06	04	51	19	05
25	D	Conv. St. Paul	05	37	18	55	05	23	18	58	05	08	19	01	05	52	18	50
26	E		06	38	18	40	06	23	18	43	06	09	18	46	06	53	18	35
27	F		07	39	18	24	07	24	18	27	07	10	18	31	07	54	18	20
28	G		08	40	18	08	08	25	18	11	08	11	18	15	08	55	18	04
29	A		09	41	17	52	09	26	17	55	09	11	17	59	09	56	17	48
30	B	K. Charles M.	10	42	17	36	10	27	17	39	10	12	17	43	10	57	17	31
31	C		11	43	17	10	11	28	17	22	11	13	17	26	11	57	17	14

February hath XXVIII Days.

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Month Days	Week Days	Remarkable days, and southing of Stars at Midnight.	Second Year 1762		Year 1766		Third Year 1763		Year 1767		Leap Year 1764		Year 1768		First Year 1765		Year 1769	
			1770		1774		1771		1775		1772		1776		1773		1777	
			☉ pla		☉ dec		☉ pla		☉ dec		☉ pla		☉ dec		☉ pla		☉ dec	
			D	M	D	M	D	M	D	M	D	M	D	M	D	M	D	M
			☞		South		☞		South		☞		South		☞		South	
1	D	Sun r. 7. 28.	12	44	17	01	12	29	17	05	12	14	17	05	12	58	16	57
2	E	Purif. Mary	13	44	16	44	13	30	16	48	13	15	16	52	13	59	16	40
3	F		14	45	16	26	14	31	16	31	14	16	16	35	15	00	16	22
4	G		15	46	16	08	15	31	16	13	15	16	16	17	16	01	16	04
5	A		16	47	15	50	16	32	15	55	16	17	15	59	17	01	15	56
6	B		17	47	15	32	17	33	15	36	17	18	15	41	18	02	15	27
7	C		18	48	15	13	18	33	15	18	18	19	15	23	19	03	15	08
8	D		19	49	14	54	19	34	14	59	19	19	15	04	20	03	14	49
9	E		20	50	14	35	20	35	14	40	20	20	14	45	21	04	14	30
10	F		21	50	14	15	21	35	14	20	21	21	14	25	22	05	14	11
11	G		22	51	13	56	22	36	14	00	22	22	14	05	23	05	13	52
12	A		23	51	13	36	23	37	13	40	23	22	13	45	24	06	13	32
13	B		24	52	13	16	24	37	13	20	24	23	13	25	25	06	13	12
14	C	Valentine	25	52	12	55	25	38	13	00	25	23	13	05	26	07	12	51
15	D	Lyon's Heart	26	53	12	34	26	38	12	40	26	24	12	45	27	08	12	30
16	E	Lyon's Neck.	27	53	12	13	27	39	12	19	27	24	12	24	28	08	12	09
17	F	Sun r. 7. 6.	28	54	11	52	28	40	11	58	28	25	12	03	29	09	11	48
18	G		29	54	11	31	29	40	11	37	29	25	11	42	30	09	11	27
19	A	Sol in Pisces	☿	55	11	10	☿	40	11	16	☿	25	11	21	01	09	11	05
20	B		01	55	10	49	01	41	10	54	01	26	10	59	02	10	10	43
21	C		02	55	10	27	02	41	10	32	02	26	10	38	03	10	10	22
22	D	Sun r. 6. 49	03	56	10	05	03	41	10	10	03	27	10	16	04	10	10	00
23	E		04	56	09	43	04	41	09	48	04	27	09	54	05	11	09	38
24	F	St. Matthias	05	56	09	21	05	42	09	26	05	27	09	31	06	11	09	16
25	G		06	57	08	59	06	42	09	04	06	27	09	09	07	11	08	54
26	A	Lower of the	07	57	08	37	07	42	08	42	07	28	08	47	08	11	08	31
27	B	two Foremost	08	57	08	14	08	42	08	20	08	28	08	25	09	11	08	09
28	C	in ☐ of Great	09	57	07	51	09	42	07	57	09	28	08	02	10	12	07	46
29	D	Bear.																
			When		it is		Leap-		Year.		10 28 Feb.		07 39 hath 29		Days			

Month Days	Week Days	Remarkable days, and fouthing of Stars at Midnight.	Second	Year	Third	Year	Leap	Year	First	Year
			1762	1766	1763	1767	1764	1768	1765	1769
			1770	1774	1771	1775	1772	1776	1773	1777
			☉ pla	☉ dec	☉ pla	☉ dec	☉ pla	☉ dec	☉ pla	☉ dec
			D M	D M	D M	D M	D M	D M	D M	D M
			✕	South	✕	South	✕	South	✕	South
1	David.		10 57	07 28	10 43	07 34	11 28	07 16	11 12	07 24
2			11 57	07 05	11 43	07 11	12 28	06 53	12 12	07 01
3			12 57	06 42	12 43	06 48	13 28	06 30	13 12	06 38
4	Sun r. 6. 29.		13 57	06 19	13 43	06 25	14 28	06 07	14 12	06 14
5			14 57	05 56	14 43	06 02	15 28	05 44	15 12	05 51
6			15 57	05 33	15 43	05 39	16 28	05 21	16 12	05 28
7			16 57	05 10	16 43	05 16	17 28	04 58	17 12	05 05
8			17 57	04 46	17 43	04 52	18 28	04 54	18 12	04 41
9			18 57	04 23	18 42	04 29	19 28	04 11	19 12	04 18
10			19 57	03 59	19 42	04 05	20 28	03 47	20 11	03 54
11	Sun r. 6. 14.		20 57	03 36	20 42	03 42	21 27	03 24	21 11	03 30
12			21 56	03 12	21 42	03 18	22 27	03 00	22 11	03 06
13	Lyon's Tail.		22 56	02 49	22 42	02 55	23 27	02 37	23 11	02 42
14	Lower of two		23 56	02 25	23 41	02 31	24 26	02 13	24 10	02 19
15	latter in ☐ of		24 56	02 01	24 41	02 07	25 26	01 49	25 10	01 55
16	great Bear.		25 55	01 37	25 41	01 43	26 26	01 25	26 09	01 32
17			26 55	01 14	26 40	01 20	27 25	01 01	27 09	01 08
18			27 54	00 50	27 40	00 56	28 25	00 38	28 09	00 44
19			28 54	00 26	28 39	00 33	29 24	00 14	29 08	00 21
20	Sol in Aries.		29 53	00 02	29 39	00 09	γ 24	Nor. 09	γ 08	Nor. 02
21	Upper of two		γ 53	Nor. 21	γ 38	Nor. 14	01 23	00 33	01 07	00 26
22	latter in ☐ of		01 52	00 44	01 38	00 38	02 23	00 56	02 06	00 50
23	great Bear.		02 51	01 08	02 37	01 02	03 22	01 20	03 06	01 14
24			03 51	01 32	03 36	01 26	04 21	01 44	04 05	01 37
25	Lady-Day.		04 50	01 56	04 36	01 50	05 21	02 08	05 04	02 01
26			05 49	02 19	05 35	02 13	06 20	02 31	06 04	02 24
27			06 48	02 43	06 34	02 37	07 19	02 54	07 03	02 48
28			07 48	03 06	07 33	03 00	08 18	03 17	08 02	03 11
29	Sun r. 5. 38.		08 47	03 30	08 33	03 24	09 17	03 41	09 01	03 35
30			09 46	03 53	09 32	03 47	10 16	04 04	10 00	03 58
31			10 45	04 16	10 31	04 10	11 16	04 27	11 00	04 21

April hath XXX Days.

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Month Days	Week Days	Remarkable days, and four-thing of Stars at Midnight.	Second Year 1762		Year 1766		Third Year 1763		Year 1767		Leap Year 1764		Year 1768		First Year 1765		Year 1769	
			1770		1774		1771		1775		1772		1776		1773		1777	
			☉ pla		☉ dec		☉ pla		☉ dec		☉ pla		☉ dec		☉ pla		☉ dec	
			D M	D M	D M	D M	D M	D M	D M	D M	D M	D M	D M	D M	D M	D M	D M	D M
			γ	North	γ	North	γ	North	γ	North	γ	North	γ	North	γ	North	γ	North
1	♈	Last but two	11 44	04 39	11 30	04 33	12 15	04 50	11 59	04 44								
2	♈	in great Bear's	12 43	05 02	12 29	04 56	13 14	05 13	12 58	05 07								
3	♈	Tail.	13 42	05 25	13 28	05 19	14 13	05 36	13 57	05 31								
4	♈	Sun r. 5. 31.	14 41	05 48	14 27	05 42	15 12	05 59	14 56	05 54								
5	♈		15 40	06 11	15 26	06 05	16 10	06 22	15 55	06 17								
6	♈		16 39	06 33	16 25	06 28	17 09	06 45	16 53	06 39								
7	♈		17 38	06 56	17 24	06 51	18 08	07 08	17 52	07 02								
8	♈	Virgin's Spike	18 37	07 18	18 22	07 13	19 07	07 30	18 51	07 24								
9	♈	Last but one	19 35	07 41	19 21	07 35	20 06	07 52	19 50	07 46								
10	♈	in great Bear's	20 34	08 03	20 20	07 57	21 05	08 14	20 49	08 08								
11	♈	Tail.	21 33	08 25	21 19	08 20	22 03	08 36	21 48	08 30								
12	♈	Sun r. 5. 12.	22 32	08 47	22 17	08 42	23 02	08 58	22 46	08 52								
13	♈		23 30	09 09	23 16	09 04	24 01	09 20	23 45	09 14								
14	♈		24 29	09 30	24 15	09 25	24 59	09 42	24 43	09 35								
15	♈	Last in great	25 28	09 52	25 13	09 47	25 58	10 03	25 42	09 57								
16	♈	Bear's Tail.	26 26	10 13	26 12	10 08	26 56	10 24	26 41	10 18								
17	♈	Sun. r. 5. 6.	27 25	10 34	27 10	10 29	27 55	10 45	27 39	10 39								
18	♈		28 23	10 55	28 09	10 50	28 53	11 06	28 38	11 00								
19	♈		29 22	11 16	29 07	11 11	29 52	11 27	29 36	11 21								
20	♈	Sol in Taurus	☿ 20	11 37	☿ 06	11 31	☿ 50	11 47	☿ 35	11 41								
21	♈	Sun r. 4. 55.	01 18	11 58	01 04	11 52	01 49	12 07	01 33	12 02								
22	♈	Dragon's Tail	02 17	12 18	02 03	12 12	02 47	12 27	02 31	12 22								
23	♈	St. George.	03 15	12 37	03 01	12 32	03 45	12 47	03 30	12 42								
24	♈	Arcturus.	04 13	12 57	03 59	12 52	04 44	13 07	04 28	13 02								
25	♈	St. Mark Evan	05 12	13 17	04 58	13 12	05 42	13 27	05 26	13 21								
26	♈		06 10	13 36	05 56	13 31	06 40	13 46	06 24	13 40								
27	♈		07 08	13 55	06 54	13 50	07 38	14 05	07 23	14 00								
28	♈	Dayinc. 6. 55.	08 06	14 14	07 52	14 09	08 37	14 24	08 21	14 19								
29	♈		09 05	14 33	08 51	14 28	09 35	14 43	09 19	14 38								
30	♈		10 03	14 51	09 49	14 47	10 33	15 01	10 17	14 56								

Month	Week Days	Remarkable days, and something of Stars at Midnight	Second	Year	Third	Year	Leap	Year	First	Year
			1762	1766	1763	1767	1764	1768	1765	1769
			1770	1774	1771	1775	1772	1776	1773	1777
			☉ pla	☉ dec	☉ pla	☉ dec	☉ pla	☉ dec	☉ pla	☉ dec
			D M	D M	D M	D M	D M	D M	D M	D M
			♈	North	♈	North	♈	North	♈	North
1	B	Phil. & Jacob	11 01	15 09	10 47	15 05	11 31	15 19	11 15	15 14
2	C		11 59	15 27	11 45	15 23	12 29	15 37	12 13	15 32
3	D	Sun r. 4. 38.	12 57	15 45	12 43	15 41	13 27	15 54	13 11	15 50
4	E		13 55	16 03	13 41	15 59	14 25	16 11	14 09	16 07
5	F	Upper of two	14 53	16 20	14 39	16 16	15 23	16 28	15 07	16 24
6	G	foremost in ☐	15 51	16 37	15 37	16 33	16 21	16 45	16 05	16 41
7	H	of Little Bear	16 49	16 53	16 35	16 50	17 19	17 02	17 03	16 58
8	I	N. Scale of ☐	17 47	17 09	17 33	17 06	18 17	17 18	18 01	17 14
9	J		18 45	17 25	18 31	17 22	19 15	17 34	18 59	17 30
10	K		19 43	17 41	19 29	17 38	20 12	17 50	19 57	17 45
11	L		20 40	17 57	20 26	17 54	21 10	18 05	20 55	18 01
12	M		21 38	18 12	21 24	18 09	22 08	18 20	21 53	18 16
13	N	Sun r. 4. 17.	22 36	18 27	22 22	18 24	23 06	18 35	22 51	18 31
14	O	Brightest in	23 34	18 42	23 20	18 38	24 04	18 49	23 48	18 45
15	P	the Crown.	24 31	18 56	24 18	18 53	25 01	19 03	24 46	19 00
16	Q	Brightest in	25 29	19 10	25 16	19 07	25 59	19 17	25 42	19 14
17	R	Serpent's neck	26 27	19 24	26 14	19 20	26 57	19 31	26 41	19 27
18	S		27 25	19 37	27 11	19 33	27 54	19 44	27 39	19 40
19	T		28 22	19 50	28 08	19 46	28 52	19 57	28 37	19 53
20	U	Scorpion's	29 20	20 03	29 06	19 59	29 50	20 09	29 34	20 06
21	V	Forehead.								
22	W	Sol in Gemini	II 18	20 15	II 04	20 12	II 47	20 21	II 32	20 18
23	X	Sun r. 4. 5.	01 15	20 27	01 01	20 24	01 45	20 33	01 29	20 30
24	Y		02 13	20 38	01 59	20 36	02 42	20 44	02 27	20 41
25	Z		03 10	20 49	02 56	20 47	03 40	20 55	03 24	20 52
26	A	Scorpion's	04 08	21 00	03 54	20 58	04 38	21 06	04 22	21 03
27	B	Heart.	05 06	21 11	04 51	21 09	05 35	21 16	05 20	21 14
28	C		06 03	21 21	05 49	21 19	06 32	21 26	06 17	21 24
29	D		07 00	21 31	06 46	21 29	07 30	21 36	07 15	21 34
30	E	K.C.II. B&R,	07 58	21 40	07 44	21 39	08 27	21 45	08 12	21 43
31	F	Sun r. 3. 55.	08 55	21 49	08 41	21 48	09 25	21 54	09 09	21 52
	G		09 53	21 58	09 39	21 56	10 22	22 02	10 07	22 01

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Year	Month	Week	Days	Remarkable	Second	Year	Third	Year	Leap	Year	First	Year
1769				days, and sou-	1762	1766	1763	1767	1764	1768	1765	1769
1777				thing of Stars	1770	1774	1771	1775	1772	1776	1773	1777
dec				at Midnight.	☉ pla	☉ dec	☉ pla	☉ dec	☉ pla	☉ dec	☉ pla	☉ dec
M					D M	D M	D M	D M	D M	D M	D M	D M
North					II	North	II	North	II	North	II	North
14	1	A	1	Sun r. 3. 52.	10 50	22 06	10 36	22 04	11 20	22 10	11 04	22 09
32	2	B	2		11 47	22 14	11 33	22 12	12 17	22 18	12 02	22 17
50	3	C	3		12 45	22 22	12 30	22 20	13 14	22 25	12 59	22 24
07	4	D	4		13 42	22 29	13 28	22 28	14 12	22 32	13 56	22 31
24	5	E	5		14 39	22 36	14 26	22 35	15 09	22 39	14 54	22 38
41	6	F	6	Sun r. 3. 50.	15 37	22 42	15 23	22 41	16 06	22 45	15 51	22 44
58	7	G	7		16 34	22 48	16 20	22 47	17 04	22 51	16 48	22 50
14	8	H	8		17 31	22 54	17 18	22 53	18 01	22 56	17 46	22 55
30	9	I	9		18 29	22 59	18 15	22 58	18 58	23 01	18 43	23 00
45	10	J	10		19 26	23 04	19 12	23 03	19 56	23 06	19 40	23 05
01	11	K	11		20 23	23 08	20 10	23 07	20 53	23 10	20 38	23 09
16	12	L	12	Sun r. 3. 48.	21 21	23 12	21 07	23 11	21 50	23 13	21 35	23 13
31	13	M	13		22 18	23 15	22 04	23 14	22 47	23 17	22 32	23 17
45	14	N	14		23 15	23 18	23 01	23 17	23 45	23 20	23 29	23 20
00	15	O	15		24 12	23 21	23 58	23 20	24 42	23 23	24 27	23 22
14	16	P	16		25 10	23 23	24 56	23 23	25 39	23 25	25 24	23 24
27	17	Q	17		26 07	23 25	25 53	23 25	26 36	23 27	26 21	23 26
40	18	R	18		27 04	23 27	26 50	23 27	27 33	23 28	27 18	23 27
53	19	S	19		28 01	23 28	27 47	23 28	28 31	23 29	28 15	23 28
06	20	T	20		28 58	23 29	28 45	23 29	29 28	23 29	29 13	23 29
18	21	U	21	Sol in Cancer	29 56	23 29	29 42	23 29	30 25	23 29	30 10	23 29
30	22	V	22	Sun r. 3. 47.	30 53	23 29	30 39	23 29	01 22	23 29	01 07	23 29
41	23	W	23		01 50	23 28	01 30	23 28	02 20	23 28	02 04	23 28
52	24	X	24	John Baptist	02 47	23 27	02 33	23 27	03 17	23 27	03 02	23 27
03	25	Y	25		03 44	23 26	03 31	23 26	04 14	23 25	03 59	23 25
14	26	Z	26		04 42	23 24	04 28	23 24	05 11	23 23	04 56	23 23
24	27	A	27	Brightest in	05 39	23 22	05 25	23 22	06 08	23 20	05 53	23 21
34	28	B	28	the Harp.	06 36	23 19	06 22	23 20	07 06	23 17	06 50	23 18
43	29	C	29	Peter Apostle.	07 33	23 16	07 19	23 17	08 03	23 14	07 47	23 15
52	30	D	30		08 30	23 13	08 17	23 13	09 00	23 11	08 45	23 11
01												

Month Days	Week Days	Remarkable days, and southing of Stars at Midnight	Second Year 1762 1770		Year 1766 1774		Third Year 1763 1771		Year 1767 1775		Leap Year 1764 1772		Year 1768 1776		First Year 1765 1773		Year 1769 1777	
			☉ pla		☉ dec		☉ pla		☉ dec		☉ pla		☉ dec		☉ pla		☉ dec	
			D	M	D	M	D	M	D	M	D	M	D	M	D	M	D	M
			☿ North		♄ North		☿ North		♄ North		☿ North		♄ North		☿ North		♄ North	
1	A		09	28	23	09	09	14	23	09	09	58	23	07	09	42	23	07
2	B		10	25	23	04	10	11	23	05	10	55	23	02	10	39	23	03
3	C		11	22	22	59	11	08	23	01	11	52	22	57	11	36	22	59
4	D		12	19	22	54	12	05	22	56	12	49	22	52	12	33	22	54
5	E		13	16	22	49	13	02	22	51	13	46	22	46	13	30	22	48
6	F		14	13	22	43	14	00	22	45	14	43	22	40	14	28	22	42
7	G	Sun r. 3. 53.	15	11	22	37	14	57	22	39	15	40	22	34	15	25	22	35
8	H		16	08	22	30	15	54	22	32	16	38	22	27	16	22	22	28
9	I		17	05	22	23	16	51	22	25	17	35	22	20	17	19	22	21
10	J		18	02	22	16	17	48	22	18	18	32	22	12	18	16	22	14
11	K	Sun r. 3. 58.	18	59	22	08	18	40	22	10	19	29	22	04	19	14	22	06
12	L		19	57	22	00	19	43	22	02	20	26	21	55	20	11	21	58
13	M		20	54	21	51	20	40	21	53	21	23	21	46	21	08	21	49
14	N		21	51	21	42	21	37	21	44	22	21	21	37	22	05	21	40
15	O		22	48	21	33	22	34	21	35	23	18	21	28	23	03	21	31
16	P		23	46	21	23	23	32	21	26	24	15	21	18	24	00	21	21
17	Q		24	43	21	13	24	29	21	16	25	12	21	08	34	57	21	11
18	R		25	40	21	03	25	26	21	05	26	10	20	57	25	54	21	00
19	S		26	37	20	52	26	24	20	54	27	07	20	46	26	52	20	49
20	T		27	35	20	41	27	21	20	43	28	04	20	35	27	49	20	38
21	U	Sun r. 4. 4.	28	33	20	29	28	18	20	32	29	02	20	24	28	46	20	27
22	V	Sol in Leo	29	30	20	17	29	15	20	20	29	59	20	12	29	43	20	15
23	W		☿	27	20	05	☿	13	20	08	☿	56	19	59	☿	41	20	03
24	X		01	24	19	03	01	10	19	56	01	53	19	46	01	38	19	50
25	Y	James Apostle	02	21	19	40	02	07	19	43	02	51	19	33	02	35	19	37
26	Z		03	19	19	27	03	05	19	30	03	48	19	20	03	33	19	24
27	A	Sun r. 4. 16.	04	16	19	14	04	02	19	17	04	46	19	06	04	30	19	10
28	B	Swan's Tail.	05	13	19	00	04	59	19	03	05	43	18	52	05	29	18	56
29	C		06	11	18	46	05	57	18	49	06	40	18	38	06	25	18	42
30	D	Dog days be.	07	08	18	31	06	54	18	35	07	38	18	23	07	22	18	28
31	E		08	06	18	16	07	52	18	20	08	35	18	08	08	20	18	13

August hath XXXI Days.

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Year	Month	Week	Remarkable days, and fouthing of Stars at Midnight.	Second 1762 1770	Year 1766 1774	Third 1763 1771	Year 1767 1775	Leap 1764 1772	Year 1768 1776	First 1765 1773	Year 1769 1777
dec	Days	Days		☉ pla	☉ dec	☉ pla	☉ dec	☉ pla	☉ dec	D M	☉ dec
M				D M	D M	D M	D M	D M	D M	☉ pla	D M
North				☉	North	☉	North	☉	North	☉	North
07	1	A	Lammas.	09 03	18 01	08 49	18 05	09 33	17 53	09 17	17 58
03	2	B	Sun r. 4. 20.	10 01	17 46	09 47	17 50	10 30	17 38	10 15	17 43
59	3	C		10 58	17 30	10 44	17 34	11 28	17 22	11 12	17 27
54	4	D		11 55	17 14	11 42	17 18	12 25	17 06	12 10	17 11
48	5	E		12 53	16 58	12 39	17 02	13 23	16 50	13 07	16 55
42	6	F		13 51	16 42	13 37	16 46	14 20	16 33	14 05	16 38
35	7	G		14 48	16 25	14 34	16 29	15 18	16 16	15 02	16 21
28	8	H		15 46	16 08	15 32	16 12	16 15	15 59	16 00	16 04
21	9	I		16 43	15 51	16 29	15 55	17 13	15 42	16 58	15 47
14	10	J		17 41	15 33	17 27	15 38	18 11	15 24	17 55	15 29
06	11	K	Sun r. 4. 35.	18 38	15 16	18 24	15 20	19 08	15 06	18 53	15 11
58	12	L		19 36	14 58	19 22	15 02	20 06	14 48	19 50	14 53
49	13	A	Sun r. 5. 39.	20 34	14 40	20 20	14 44	21 04	14 30	20 48	14 35
40	14	B		21 31	14 21	21 18	14 26	22 01	14 11	21 46	14 17
31	15	C		22 29	14 02	22 15	14 07	22 59	13 53	22 44	13 58
21	16	D		23 27	13 43	23 13	13 48	23 57	13 34	23 41	13 39
11	17	E		24 25	13 24	24 11	13 29	24 55	13 15	24 39	13 20
00	18	F		25 22	13 05	25 09	13 10	25 52	12 55	25 37	13 00
49	19	G		26 20	12 45	26 06	12 50	26 50	12 36	26 35	12 41
38	20	H		27 18	12 25	27 04	12 30	27 48	12 16	27 33	12 21
27	21	I	Sun r. 4. 53.	28 16	12 05	28 02	12 10	28 46	11 56	28 30	12 01
15	22	J		29 14	11 45	29 00	11 51	29 44	11 35	29 28	11 41
03	23	K	Sol in Virgo.	☿ 12	11 25	29 58	11 30	☿ 42	11 15	☿ 26	11 21
50	24	L	Barthol. Ap.	01 10	11 05	☿ 56	11 09	01 40	10 54	01 24	11 00
37	25	A		02 08	10 44	01 54	10 49	02 38	10 33	02 22	10 39
24	26	B		03 06	10 23	02 52	10 28	03 36	10 12	03 20	10 18
10	27	C		04 04	10 02	03 50	10 07	04 34	09 51	04 18	09 57
56	28	D		05 02	09 41	04 48	09 46	05 32	09 30	05 16	09 36
42	29	E		06 00	09 20	05 46	09 25	06 30	09 09	06 14	09 15
28	30	F	Sun r. 5. 13.	06 58	08 58	06 44	09 04	07 28	08 47	07 12	08 53
13	31	G		07 56	08 36	07 42	08 42	08 26	08 25	08 10	08 31

September hath XXX Days.

Month	Week	Days	Remarkable days, and sou- thing of Stars at Midnight	Second Year		Third Year		Leap Year		Year		First Year		Year			
				1762	1766	1763	1767	1764	1768	1765	1769						
				1770	1774	1771	1775	1772	1776	1773	1777						
				☉	pla	☉	dec	☉	pla	☉	dec	☉	pla	☉	dec		
				D	M	D	M	D	M	D	M	D	M	D	M		
				☉	North	☉	North	☉	North	☉	North	☉	North	☉	North		
1	A	F	Fomelhaut	08	54	08	14	08	40	08	20	09	24	08	03	09	09
2	B	G	London b. 66	19	53	07	52	09	38	07	58	10	22	07	41	10	07
3	C	A	First in Pega-	10	51	07	30	10	37	07	36	11	21	07	19	11	05
4	D	B	fus's Wing.	11	49	07	08	11	35	07	13	12	19	06	57	12	03
5	E	C		12	47	06	46	12	33	06	51	13	17	06	35	13	07
6	F	D		13	40	06	24	13	32	06	29	14	16	06	12	14	00
7	G	E	Sun r. 5. 28.	14	44	06	01	14	30	06	07	15	14	05	50	14	58
8	A	F	Dog days end	15	42	05	38	15	28	05	44	16	12	05	27	15	57
9	B	G		16	41	05	16	16	27	05	22	17	11	05	04	16	55
10	C	A		17	39	04	53	17	25	04	59	18	09	04	41	17	54
11	D	B		18	38	04	30	18	24	04	36	19	08	04	18	18	52
12	E	C	Sun r. 5. 35.	19	36	04	07	19	22	04	13	20	06	03	55	19	51
13	F	D		20	35	03	44	20	21	03	50	21	05	03	32	20	49
14	G	E		21	33	03	21	21	19	03	27	22	04	03	09	21	48
15	A	F		22	32	02	58	22	18	03	04	23	02	02	46	22	46
16	B	G		23	30	02	35	23	16	02	40	24	01	02	23	23	45
17	C	A	Sun r. 5. 49.	24	29	02	11	24	15	02	17	24	59	02	00	24	44
18	D	B		25	28	01	47	25	14	01	53	25	58	01	36	25	42
19	E	C		26	26	01	24	26	12	01	30	26	57	01	13	26	41
20	F	D	Andro. head	27	25	01	01	27	11	01	07	27	56	00	49	27	40
21	G	E	Mathew Evan	28	24	00	38	28	10	00	44	28	55	00	26	28	38
22	A	F	Sun r. 6. 0. }	29	23	00	14	29	09	00	20	29	53	00	02	29	37
23	B	G	Sol in Libra }	22	22	Sou.	09	22	07	Sou.	03	22	52	Sou.	21	22	36
24	C	A	End of Pega- fus's Wing.	01	21	00	32	01	06	00	02	01	51	00	44	01	35
25	D	B		02	20	00	56	02	05	00	50	02	50	01	08	02	34
26	E	C		03	19	01	19	03	04	01	13	03	49	01	31	03	33
27	F	D		04	18	01	43	04	03	01	37	04	48	01	55	04	32
28	G	E	Sun r. 6. 9.	05	17	02	06	05	02	02	00	05	47	02	18	05	31
29	A	F	St. Michael.	06	16	02	29	06	01	02	23	06	46	02	41	06	30
30	B	G		07	15	02	52	07	01	02	46	07	45	03	05	07	29

October hath XXXI Days.

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Year 1769 1777	Month Days	Week Days	Remarkable days, and four- thing of Stars at Midnight.	Second Year 1762 1770		Year 1766 1774		Third Year 1763 1771		Year 1767 1775		Leap Year 1764 1772		Year 1768 1776		Year 1765 1773		Year 1769 1777	
				☉ pla		☉ dec		☉ pla		☉ dec		☉ pla		☉ dec		☉ pla		☉ dec	
				D	M	D	M	D	M	D	M	D	M	D	M	D	M	D	M
				☐		South		☐		South		☐		South		☐		South	
			Sun r. 6. 13.	08	14	03	16	08	00	03	10	08	45	03	28	08	28	13	23
				09	13	03	39	08	59	03	34	09	44	03	52	09	28	03	46
				10	12	04	03	09	58	03	57	10	43	04	15	10	27	04	09
				11	12	04	26	10	57	04	26	11	42	04	38	11	20	14	32
			Pole Star.	12	11	04	49	11	57	04	44	12	42	05	01	12	25	04	55
				13	10	05	12	12	56	05	07	13	41	05	24	13	25	05	18
				14	10	05	35	13	55	05	30	14	40	05	47	14	24	05	41
			Southernmost	15	09	05	58	14	55	05	53	15	40	06	10	15	23	06	04
			in Androme-																
			da's Girdle.	16	08	06	21	15	54	06	16	16	39	06	33	16	23	06	27
			Sun r. 6. 29.	17	08	06	44	16	53	06	39	17	39	06	56	17	22	06	49
				18	07	07	07	17	53	07	02	18	38	07	19	18	22	07	12
			Sun r. 6. 35.	19	07	07	30	18	52	07	25	19	37	07	42	19	21	07	35
				20	06	07	53	19	52	07	48	20	37	08	04	20	21	07	58
				21	06	08	15	20	52	08	10	21	37	08	26	21	20	08	20
				22	06	08	37	21	51	08	32	22	36	08	48	22	20	08	42
				23	05	08	59	22	51	08	54	23	36	09	10	23	20	09	04
				24	05	09	21	23	50	09	16	24	36	09	32	24	19	09	26
			Luke Evan.	25	05	09	43	24	50	09	38	25	35	09	54	25	19	09	48
				26	04	10	05	25	50	10	00	26	35	10	16	26	19	10	10
				27	04	10	27	26	50	10	22	27	35	10	38	27	19	10	32
				28	04	10	48	27	50	10	43	28	35	10	59	28	19	10	54
			Andromeda's	29	04	11	09	28	49	11	04	29	35	11	20	29	18	11	15
			Southernmost	☾	04	11	30	29	49	11	25	☾	35	11	41	☾	18	11	36
			Foot.	01	04	11	51	☾	49	11	46	01	35	11	02	01	18	11	57
			Sol in Scorpio																
			Sun r. 7. 4.	02	04	12	12	01	49	12	07	02	35	12	23	02	18	12	18
				03	04	12	33	02	49	12	28	03	35	12	44	03	18	12	38
				04	04	12	53	03	49	12	49	04	35	13	04	04	18	12	59
			Simon & Jude	05	04	13	13	04	49	13	09	05	35	13	24	05	18	13	29
				06	04	13	33	05	49	13	29	06	35	13	44	06	18	13	39
			Sun r. 7 10.	07	04	13	53	06	49	13	49	07	35	14	04	07	18	13	58
				08	04	14	13	07	49	14	08	08	35	14	23	08	18	14	17

Month Days	Week Days	Remarkable days, and southing of Stars at Midnight.	Second Year 1762 1770		Year 1766 1774		Third Year 1763 1771		Year 1767 1775		Leap Year 1764 1772		Year 1768 1776		First Year 1765 1773		Year 1769 1777	
			☉ pla	☉ dec	☉ pla	☉ dec	☉ pla	☉ dec	☉ pla	☉ dec	☉ pla	☉ dec	☉ pla	☉ dec	D M	☉ pla	D M	☉ dec
			J M	D M	D M	D M	D M	D M	D M	D M	D M	D M	D M	D M	☉ pla	D M	D M	D M
			☿	South	☿	South	☿	South	☿	South	☿	South	☿	South	☿	South	☿	South
1	I	All Saints.	09 04	14 32	08 50	14 27	09 35	14 42	09 35	14 42	09 35	14 42	09 35	14 42	09 19	14 37	14 37	14 37
2	II	Sun r. 7. 14.	10 04	14 51	09 50	14 47	10 35	15 01	10 35	15 01	10 35	15 01	10 35	15 01	10 19	14 56	14 56	14 56
3	III	K. Will. Nat.	11 05	15 10	10 50	15 06	11 30	15 20	11 30	15 20	11 30	15 20	11 30	15 20	11 19	15 15	15 15	15 15
4	IV		12 05	15 29	11 50	15 25	12 30	15 39	12 30	15 39	12 30	15 39	12 30	15 39	12 19	15 34	15 34	15 34
5	V	Powder Plot.	13 05	15 47	12 51	15 43	13 36	15 57	13 36	15 57	13 36	15 57	13 36	15 57	13 20	15 52	15 52	15 52
6	VI		14 05	16 05	13 51	16 01	14 37	16 15	14 37	16 15	14 37	16 15	14 37	16 15	14 20	16 10	16 10	16 10
7	VII		15 06	16 23	14 51	16 15	15 37	16 33	15 37	16 33	15 37	16 33	15 37	16 33	15 20	16 28	16 28	16 28
8	VIII		16 06	16 41	15 52	16 37	16 37	16 50	16 37	16 50	16 37	16 50	16 37	16 50	16 21	16 45	16 45	16 45
9	IX	Sun r. 7. 29. Martin B.	17 07	16 58	16 52	16 54	17 38	17 07	17 38	17 07	17 38	17 07	17 38	17 07	17 21	17 02	17 02	17 02
10	X		18 07	17 15	17 52	17 11	18 38	17 24	18 38	17 24	18 38	17 24	18 38	17 24	18 22	17 19	17 19	17 19
11	XI		19 07	17 32	18 53	17 28	19 39	17 40	19 39	17 40	19 39	17 40	19 39	17 40	19 22	17 36	17 36	17 36
12	XII		20 08	17 48	19 53	17 44	20 39	17 56	20 39	17 56	20 39	17 56	20 39	17 56	20 23	17 52	17 52	17 52
13	I	Sun r. 7. 34.	21 08	18 04	20 54	18 00	21 40	18 12	21 40	18 12	21 40	18 12	21 40	18 12	21 23	18 08	18 08	18 08
14	II		22 09	18 20	21 54	18 16	22 40	18 28	22 40	18 28	22 40	18 28	22 40	18 28	22 24	18 24	18 24	18 24
15	III		23 10	18 35	22 55	18 32	23 41	18 43	23 41	18 43	23 41	18 43	23 41	18 43	23 24	18 39	18 39	18 39
16	IV		24 10	18 50	23 55	18 47	24 41	18 58	24 41	18 58	24 41	18 58	24 41	18 58	24 25	18 54	18 54	18 54
17	V	Sol in Sagit.	25 11	19 05	24 56	19 02	25 42	19 13	25 42	19 13	25 42	19 13	25 42	19 13	25 25	19 09	19 09	19 09
18	VI		26 11	19 20	25 57	19 16	26 43	19 27	26 43	19 27	26 43	19 27	26 43	19 27	26 25	19 24	19 24	19 24
19	VII		27 12	19 34	26 57	19 30	27 43	19 41	27 43	19 41	27 43	19 41	27 43	19 41	27 26	19 38	19 38	19 38
20	VIII		28 12	19 48	27 58	19 44	28 44	19 54	28 44	19 54	28 44	19 54	28 44	19 54	28 27	19 51	19 51	19 51
21	IX	Sun r. 7. 47	29 14	20 01	28 59	19 58	29 45	20 07	29 45	20 07	29 45	20 07	29 45	20 07	29 28	20 04	20 04	20 04
22	X		30 14	20 14	29 59	20 11	30 46	20 20	30 46	20 20	30 46	20 20	30 46	20 20	30 29	20 17	20 17	20 17
23	XI		01 15	20 27	01 00	20 24	01 46	20 32	01 46	20 32	01 46	20 32	01 46	20 32	01 30	20 30	20 30	20 30
24	XII		02 16	20 39	02 01	20 36	02 47	20 44	02 47	20 44	02 47	20 44	02 47	20 44	02 30	20 42	20 42	20 42
25	I	Aldebaran.	03 17	20 51	03 02	20 48	03 48	20 56	03 48	20 56	03 48	20 56	03 48	20 56	03 31	20 54	20 54	20 54
26	II		04 17	21 02	04 03	20 59	04 40	21 08	04 40	21 08	04 40	21 08	04 40	21 08	04 32	21 05	21 05	21 05
27	III		05 18	21 13	05 03	21 10	05 50	21 19	05 50	21 19	05 50	21 19	05 50	21 19	05 33	21 16	21 16	21 16
28	IV		06 19	21 24	06 04	21 21	06 51	21 30	06 51	21 30	06 51	21 30	06 51	21 30	06 34	21 26	21 26	21 26
29	V	Andrew Ap.	07 20	21 34	07 05	21 31	07 51	21 40	07 51	21 40	07 51	21 40	07 51	21 40	07 35	21 36	21 36	21 36
30	VI		08 21	21 44	08 06	21 41	08 52	21 49	08 52	21 49	08 52	21 49	08 52	21 49	08 36	21 46	21 46	21 46

December hath XXXI Days.

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Year	Month	Week	Remarkable days, and southing of Stars at Midnight.	Second Year 1762 1770	Year 1766 1774	Third Year 1763 1771	Year 1767 1775	Leap Year 1764 1772	Year 1768 1776	First Year 1765 1773	Year 1769 1777
dec	Days	Days		☉ pla	☉ dec	☉ pla	☉ dec	☉ pla	☉ dec	☉ pla	☉ dec
M				D M	D M	D M	D M	D M	D M	D M	D M
outh				♂	South	♂	South	♂	South	♂	South
37	1	A	Sun r. 7. 58.	09 22	11 53	09 07	21 51	09 53	21 58	09 37	21 55
56	2	B		10 23	12 02	10 08	22 00	10 54	22 07	10 38	22 04
15	3	C		11 24	12 11	11 09	22 09	11 55	22 15	11 38	22 13
34	4	D		12 25	12 19	12 10	22 17	12 56	22 23	12 39	22 21
52	5	E		13 26	22 27	13 11	22 25	13 57	22 31	13 40	22 29
10	6	F		14 27	22 34	14 12	22 32	14 58	22 38	14 41	22 36
28	7	G		15 28	22 41	15 13	22 39	15 59	22 45	15 42	22 43
45	8	H		16 29	22 47	16 14	22 46	17 00	22 51	16 43	22 49
02	9	I		17 30	22 53	17 15	22 52	18 01	22 56	17 44	22 55
19	10	J		18 31	22 59	18 16	22 58	19 02	23 01	18 45	23 00
36	11	K	Sun r. 8. 5	19 32	23 04	19 17	23 03	20 03	23 06	19 47	23 05
52	12	L	First in Ori- on's Belt.	20 33	23 09	20 18	23 08	21 04	23 10	20 48	23 10
08	13	M		21 34	23 13	21 19	23 12	22 05	23 14	21 49	23 14
24	14	N	Last in Ori- on's Belt.	22 35	23 16	22 20	23 16	23 07	23 18	22 50	23 17
39	15	O		23 36	23 19	23 21	23 19	24 08	23 21	23 51	23 20
54	16	P		24 37	23 22	24 23	23 22	25 09	23 23	24 52	23 23
09	17	Q	Orion's right	25 38	23 24	25 24	23 24	26 10	23 25	25 53	23 25
24	18	R	shoulder and	26 39	23 26	26 25	23 26	27 11	23 27	26 54	23 27
38	19	S	Auriga's right	27 41	23 27	27 26	23 28	28 12	23 28	27 55	23 28
51	20	T	shoulder.	28 42	23 28	28 27	23 29	29 13	23 29	28 57	23 29
04	21	U	Sun r. 8. 9.	29 43	23 29	29 28	23 29	30 14	23 29	29 58	23 29
17	22	V	Thomas Ap.	30 44	23 29	30 29	23 29	01 15	23 29	30 59	23 29
30	23	W	Sol, in Capri	01 45	23 28	01 31	23 28	02 16	23 28	01 00	23 28
42	24	X	Foot of g. Dog	02 47	23 27	02 32	23 27	03 17	23 26	02 01	23 27
54	25	Y	Nat. of Christ	03 48	23 25	03 33	23 26	04 18	23 24	03 02	23 25
05	26	Z	St Stephen	04 49	23 23	04 34	23 24	05 19	23 22	04 03	23 23
16	27	A	St. John Evan	05 50	23 21	05 35	23 22	06 20	23 20	05 04	23 20
26	28	B	Innocents.	06 51	23 18	06 36	23 19	07 21	23 17	06 05	23 17
36	29	C	Mouth of the	07 52	23 14	07 38	23 16	08 22	23 13	07 06	23 14
46	30	D	great Dog or	08 54	23 10	08 39	23 12	09 23	23 09	08 07	23 10
	31	E	Syrius.	09 55	23 06	09 40	23 08	10 24	23 04	09 08	23 06

A TABLE of the Variation of the Sun's Declination to every
15 Degrees of Longitude, from the Meridian of *London*.

Degrees of Longitude from the Meridian of L O N D O N.

Lat. ly. Vari.	Deg. 15	Deg. 30	Deg. 45	Deg. 60	Deg. 75	Deg. 90	Deg. 105	Deg. 120	Deg. 135	Deg. 150	Deg. 165	Deg. 180
Min.	min.	min.	min.	min.	min.	min.	min.	min.	min.	min.	min.	min.
2	00	00	00	00	00	00	01	01	01	01	01	01
3	00	00	00	00	01	01	01	01	01	01	01	01
4	00	00	00	01	01	01	01	01	02	02	02	02
5	00	00	01	01	01	01	01	02	02	02	02	02
6	00	00	01	01	01	01	02	02	02	02	03	03
7	00	01	01	01	01	02	02	02	03	03	03	03
8	00	01	01	01	02	02	02	03	03	03	04	04
9	00	01	01	01	02	02	03	03	03	04	04	04
10	00	01	01	02	02	02	03	03	04	04	05	05
11	00	01	01	02	02	03	03	04	04	05	05	05
12	00	01	01	02	02	03	03	04	04	05	05	06
13	01	01	02	02	03	03	04	04	05	05	06	06
14	01	01	02	02	03	03	04	05	05	06	06	07
15	01	01	02	03	03	04	04	05	06	06	07	07
16	01	01	02	03	03	04	05	05	06	07	07	08
17	01	01	02	03	04	04	05	06	06	07	08	08
18	01	02	02	03	04	04	05	06	07	07	08	09
19	01	02	02	03	04	05	06	06	07	08	09	09
20	01	02	02	03	04	05	06	07	07	08	09	10
21	01	02	03	03	04	05	06	07	08	09	10	10
22	01	02	03	04	05	05	06	07	08	09	10	11
23	01	02	03	04	05	06	07	08	09	10	11	11
24	01	02	03	04	05	06	07	08	09	10	11	12

IN every Page there are 11 Columns, the first shews the Day of the Month, the second the Day of the Week, expressed by the Letters A, B, C, &c. the third the Southing of several Stars at Midnight, at which Time the said Stars may (in the Absence of the Moon, and Weather permitting) be observed, thereby to find the Latitude; in the same Column is given the Time of Sun-rising, (and by subtracting the Time of rising from 12 Hours, gives the Time of setting) the eight following Columns shew the Sun's Place and Declination for Second Year after Leap-Year, Third, Leap-Year, and first Year after, according to their respective Titles.

For the more ready knowing of Leap-Year, the following Table is inserted, where is found by Inspection, in the Third Column, and then follow the First, Second, and Third Years after Leap-Year.

Second Year.	Third Year.	Leap-Year.	First Year.
1762	1763	1764	1765
1766	1767	1768	1769
1770	1771	1772	1773
1774	1775	1776	1777
1778	1779	1780	1781
1782	1783	1784	1785
1786	1787	1788	1789
1790	1791	1792	1793

The Use of the CALENDAR.

To find the Day of the Week or Month for any Time past, or to come, by the Calendar.

First, Find the Dominical Letter for the Year, then proceed as follows.

Example 1. Suppose it is required to find what Day of the Month will be the third *Wednesday* in *March*, 1763.

Having found the Dominical Letter by the Directions in Page 22, or by the Table in Page 39, to be B, turn to the Month of *March*, and account B for *Sunday*, then the Letter E is for *Wednesday*, and the Third *Wednesday* is the 16th of *March*, which was required.

Example 2. What Day of the Week will the second of *September* be on in the Year 1772.

This Year being Leap-Year has two Dominical Letters, E and D; the first Letter, to wit E, serving from the first of *January* to the End of *February*; the last Letter, to wit D, serves from thence to the Years End.

Wherefore looking against the second of *September*, there stands G, which represents *Wednesday*, the Day of the Week required.

To find the Sun's Place and Declination by the Calendar.

Example 1. Suppose the Sun's Place and Declination be required on the 10th of *January*, 1764, being Leap-Year.

In the Month of *January* in the first Column look the Day of the Month, over against which, under Leap-Year stands 19 52, that is, the Sun's Place is in 19 deg. 52 min. of *Capricornus*: In the next Column under the said Year stands 22.01, under the Title South, which shews the Declination to be 22 deg. 01 min. Southerly; and this also will practically serve for the Year 1776, for the said 10th of *January*, being Leap-Year.

Example 2. Suppose the Sun's Place and Declination is required on the 10th of *March*, 1766, being the second after Leap-Year.

In the Month of *March*, in the first Column find the Day of the Month, over-against which, under Second Year, stands 19.57 which shews the Sun's Place to be in 19 deg. 57 min. of *Pisces*; and in the next Column under Second Year, stands 03.59, which shews the Declination to be 03d 59m. Southerly, which was required.

Although it is common to take the Declination as it is in the Calendar, yet if the Difference of Longitude be considerable from *London*, it is requisite the Declination should be corrected, because in the Calendar it is calculated for the Meridian of *London*, for which End the *Table of the Variation of the Sun's Declination to every 15 Degrees of Longitude from the Meridian of London*, immediately following the Calendar, is added; the Use and Explanation whereof follows.

IN the first Column of this Table is the daily Variation, which is found by subtracting the Declination of the given Day of the Month found in the Calendar, from the Declination for the Day following: or contrarily this from that, that is, the lesser from the greater, and the Difference is the daily Variation: In the Head of the other Columns are Degrees of Longitude from *London*, either Easterly or Westerly, and in those Columns under the respective deg. of Longitude, are the Minutes of the Declination, answerable to the daily Variation: As suppose the daily Variation was 10 min. and the Difference of Longitude 90 deg. against 10 in the first Column, and under 90 deg. at the Head of the Table, stands 2 Minutes answering thereunto, and are to be used as follows.

The Use of the Table of the Variation of the Sun's Declination.

The Rule. First, If the Difference of Longitude be Westerly, and the Declination increasing, the Variation found in this Table must be added to the Declination found in the Calendar; but if the Declination be decreasing, it must be subtracted therefrom.

Secondly, If the Difference of Longitude be Easterly, and the Declination increasing, the Variation aforesaid must be subtracted; but the Declination decreasing, it must be added.

Example 1. April the 19th, 1764, being at Sea, the Difference of Longitude from the Meridian of *London*, 90 degrees Westerly, I find the Decli-

of the Table of Variation of the Sun's Declination. 55

Declination in the Calendar to be 11 deg. 27 min. North; and the 20th Day, the Declination is 11 deg. 47 min. therefore subtracting the lesser Declination from the greater, the Remainder is 20 min. which is the daily Increase; Then in the Table under 90 deg. and over against 20, stands 5 min. (which because the Difference of Longitude is Westerly, and the Declination increasing) must be added to 11 deg. 27 min. before found, which makes the true Declination 11 deg. 32 min. North.

If the Difference of Longitude in this Case had been Easterly, the 5 min. found in the Table must have been subtracted.

Note. It is easily discerned, whether the Declination increases or decreases, by observing whether the Declination for the Day following be greater or lesser: For if it be greater, then it increases; but if less, then it decreases.

Example 2. January the 25th, 1763, being at Sea, the Difference of Longitude from London, 120 deg. Westerly: I find the Declination in the Calendar to be 18 deg. 58 min. South, and the 26th Day it is 18 deg. 43 min. therefore subtracting the lesser from the greater, the Difference is 15 min. which is the daily decrease; then in this Table under 120 deg. and against 15 stands 5 min. (which because the Difference of Longitude is Westerly, and the Declination decreasing) must be subtracted, which makes the true Declination 18 deg. 53 min. South: If the Difference of Longitude had been Easterly, the 5 min. must have been added.

The Use of the Sun's Declination to find the Latitude.

The Knowledge of the Sun's Declination at any Time, and in any Longitude, is of great Importance at Sea, for by this, and the Complement of the Sun's Meridian Altitude (commonly called the Zenith Distance) taken with a Quadrant or Cross-staff, is found the Latitude of the Place the Ship is then in; to perform which take the following Rules.

Rule 1. If the Sun comes to the Meridian in the South, and the Declination be North, then the Declination added to the Complement of the Meridian Altitude is the Latitude, North.

Example. Suppose at Sea, the 10th of April, 1764, the Declination found by the Table is 8 deg. 14 min. North, the Sun comes to the Meridian in the South; the Complement of the Meridian Altitude by Observation is 23 deg. 10 min. What is the Latitude?

Complement of the Meridian Altitude is - - 23 10 South

Declination of the Sun is - - - - - 08 14 North

The Latitude of the Place is - - - - - 31 24 North

Rule 2. If the Sun comes to the Meridian in the North, and hath North Declination, then subtract the Complement of the Meridian Altitude from the Declination, the Remainder is the Latitude, North: But if the Complement of the Altitude exceed the Declination, subtract the Declination therefrom, and the Remainder is the Latitude, South.

Example 1. Suppose at Sea, May 20, 1764, the Declination being 20 deg. 09 min. North, the Sun comes to the Meridian in the North, and by observing with a Quadrant the Sun's Zenith Distance is 18 deg. 42 min. What is the Latitude of the Place?

Sun's

The Use of the Table of the Sun's Declination.

Sun's Declination is - - - - - 20d. : 09m. North

The Sun's Zenith Distance - - - - - 18d. : 42m. North

The Latitude is - - - - - 1d. : 27m. North

Example 2. At Sea, *June* 10th, 1763, the Sun's Declination by the Tables is 23 deg. 5 min. North, the Complement of the Meridian Altitude by Observation is 33 deg. 10 min. the Sun comes to the Meridian in the North.

Complement of the Sun's Meridian Altitude is - - 33d. : 10m. North

Sun's Declination - - - - - 23d. : 03m. North

The Latitude is - - - - - 10d. : 03m. North

Rule 3. If the Sun comes to the Meridian in the North, and hath South Declination, the Declination added to the Complement of the Altitude is the Latitude, South.

Example 3. At Sea, *January* 29th, 1764, the Sun comes to the Meridian in the North, the Complement of the Meridian Altitude is 22 deg. 10 min. What is the Latitude?

Complement of the Sun's Meridian Altitude is - - 22d. : 10m. North

Sun's Declination is - - - - - 17d. : 59m. South

The Latitude is - - - - - 40d. : 09m. South

Rule 4. If the Sun comes to the Meridian in the South, and hath South Declination, subtract the Complement of the Meridian Altitude from the Declination, the Remainder is the Latitude South: But if the Complement of the Meridian Altitude exceeds the Declination, subtract the Declination therefrom, the Remainder is the Latitude, North.

Example 1. At Sea, *January* 1st, 1764, the Sun cometh to the Meridian in the South: The Complement of the Meridian Altitude is 10 deg. 36 min. What is the Latitude?

Sun's Declination - - - - - 23d. : 03m. South

Complement of Meridian Altitude - - - - - 10d. : 36m. South

Latitude of the Place - - - - - 12d. : 27m. South

Example 2. At Sea, *February* 18th, 1762, the Sun cometh to the Meridian in the South, the Complement of the Meridian Altitude is 25 deg. 20 min. What is the Latitude?

Complement of the Sun's Meridian Altitude - - 25d. : 20m. South

Sun's Declination - - - - - 11d. : 31m. South

Latitude - - - - - 13d. : 49m. North

Rule 5. If the Sun or Star observed, be in the Zenith (that is, right over Head) and has either North or South Declination, that Declination is the Latitude either North or South agreeable to the Name.

Rule 6. If the Sun or Star observed hath no Declination, the Complement of the Meridian Altitude is the Latitude, and is North or South, according as the Ship to the Northwards or Southward of the Sun.

A Table of the Sun's Right Ascension.

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Days	<i>Jan.</i>		<i>Feb.</i>		<i>March</i>		<i>April</i>		<i>May</i>		<i>June</i>	
	☉ Right Ascen.		☉ Right Ascen.		☉ Right Ascen.		☉ Right Ascen.		☉ Right Ascen.		☉ Right Ascen.	
	h.	m.	h.	m.	h.	m.	h.	m.	h.	m.	h.	m.
1	18	49	21	01	22	50	00	43	02	34	04	37
2	18	53	21	05	22	54	00	47	02	38	04	41
3	18	58	21	09	22	57	00	50	02	42	04	45
4	19	02	21	13	23	01	00	54	02	46	04	49
5	19	06	21	17	23	05	00	58	02	50	04	53
6	19	11	21	21	23	08	01	01	02	53	04	57
7	19	15	21	25	23	12	01	05	02	57	05	01
8	19	19	21	29	23	16	01	09	03	01	05	06
9	19	24	21	33	23	19	01	12	03	05	05	10
10	19	28	21	37	23	23	01	16	03	09	05	14
11	19	32	21	41	23	27	01	20	03	13	05	18
12	19	37	21	45	23	31	01	24	03	17	05	22
13	19	41	21	49	23	34	01	27	03	21	05	26
14	19	45	21	53	23	38	01	31	03	25	05	31
15	19	50	21	56	23	41	01	34	03	29	05	35
16	19	54	22	00	23	45	01	38	03	33	05	39
17	19	58	22	04	23	49	01	42	03	37	05	43
18	20	02	22	08	23	53	01	45	03	41	05	47
19	20	07	22	12	23	56	01	49	03	45	05	51
20	20	11	22	16	00	00	01	53	03	49	05	56
21	20	15	22	20	00	03	01	57	03	53	06	00
22	20	19	22	23	00	07	02	00	03	57	06	04
23	20	24	22	27	00	11	02	04	04	01	06	08
24	20	28	22	31	00	14	02	08	04	05	06	12
25	20	32	22	35	00	18	02	12	04	09	06	16
26	20	36	22	39	00	21	02	15	04	13	06	20
27	20	40	22	42	00	25	02	19	04	17	06	25
28	20	44	22	46	00	29	02	23	04	21	06	29
29	20	49			00	32	02	27	04	25	06	33
30	20	53			00	36	02	30	04	29	06	37
31	20	57			00	40			04	32		

Days	July		August		Septem.		October		Novem.		Decemb.	
	☉ Right Ascen.		☉ Right Ascen.		☉ Right Ascen.		☉ Right Ascen.		☉ Right Ascen.		☉ Right Ascen.	
	h.	m.	h.	m.	h.	m.	h.	m.	h.	m.	h.	m.
1	06	41	08	46	10	42	12	30	14	27	16	31
2	06	45	08	50	10	46	12	34	14	31	16	35
3	06	49	08	54	10	49	12	38	14	35	16	39
4	06	54	08	57	10	53	12	41	14	39	16	44
5	06	58	09	01	10	57	12	45	14	43	16	48
6	07	02	09	05	11	00	12	49	14	46	16	52
7	07	06	09	09	11	04	12	52	14	50	16	57
8	07	10	09	13	11	07	12	56	14	54	17	01
9	07	14	09	17	11	11	13	00	14	58	17	06
10	07	18	09	21	11	15	13	03	15	03	17	10
11	07	22	09	24	11	18	13	07	15	07	17	14
12	07	26	09	28	11	22	13	11	15	11	17	18
13	07	30	09	32	11	25	13	14	15	15	17	22
14	07	35	09	36	11	29	13	18	15	19	17	27
15	07	39	09	39	11	33	13	22	15	23	17	32
16	07	43	09	43	11	36	13	25	15	27	17	36
17	07	47	09	47	11	40	13	29	15	31	17	41
18	07	51	09	51	11	43	13	33	15	35	17	45
19	07	55	09	54	11	47	13	37	15	40	17	50
20	07	59	09	58	11	51	13	41	15	44	17	54
21	08	03	10	02	11	54	13	44	15	48	17	59
22	08	07	10	06	11	58	13	48	15	52	18	03
23	08	11	10	09	12	01	13	52	15	56	18	08
24	08	15	10	13	12	05	13	56	16	01	18	12
25	08	19	10	17	12	09	14	00	16	05	18	17
26	08	23	10	20	12	12	14	03	16	09	18	21
27	08	27	10	24	12	16	14	07	16	13	18	25
28	08	30	10	28	12	19	14	11	16	18	18	30
29	08	34	10	31	12	23	14	15	16	22	18	34
30	08	38	10	35	12	27	14	19	16	26	18	39
31	08	42	10	39			14	23			18	43

A TABLE shewing the Right Ascension, Declination,
and Magnitude of the Principal Fixed Stars.

Names of the Stars.	Magnit.	Right Ascen.		Declination	
		h.	m.	d.	m.
<i>END of Pegasus's Wing, Algenib</i> —————	2	00	01	13	51 N
<i>Pole Star</i> —————	2	00	44	88	01 N
<i>Girdle of Andromeda</i> —————	2	00	56	34	19 N
<i>Bright Star in Aries</i> —————	2	01	54	22	19 N
<i>Medusa's Head, Algol</i> —————	2	02	52	40	00 N
<i>Bright side of Perseus</i> —————	2	03	07	48	59 N
<i>Aldebaran, or Bull's Eye</i> —————	1	04	22	16	00 N
<i>Capella, or the Goat</i> —————	1	04	59	45	44 N
<i>Bright Foot of Orion, Rigel</i> —————	1	05	03	08	30 S
<i>Middle Star in Orion's Belt</i> —————	3	05	24	01	23 S
<i>Orion's Right Shoulder</i> —————	1	05	42	07	21 N
<i>Auriga's Right Shoulder</i> —————	2	05	40	44	54 N
<i>Bright Foot of Gemini</i> —————	2	06	24	16	35 N
<i>Syrus, or the Great Dog</i> —————	1	06	35	16	24 S
<i>Castor, or Northmost Twin</i> —————	2	07	19	32	23 N
<i>Procyon, or the Little Dog</i> —————	2	07	27	05	49 N
<i>Pollux, or Southmost Twin</i> —————	2	07	31	28	35 N
<i>Hydra's Heart</i> —————	1	09	16	07	38 S
<i>Lyon's Heart, or Regulus</i> —————	1	09	55	13	08 N
<i>The Lower of the Pointers</i> —————	2	10	45	57	42 N
<i>The Upper of the Pointers</i> —————	2	10	47	63	03 N
<i>Lyon's Tail, Deneb</i> —————	1	11	37	15	54 N
<i>Upper of the two last in □ of the Great Bear</i> —————	2	12	01	58	23 N
<i>Last but two in the Great Bear's Tail</i> —————	2	12	41	57	18 N
<i>Virgin's Spike</i> —————	1	13	13	09	54 S
<i>Last but one in the Great Bear's Tail</i> —————	2	13	12	56	13 N
<i>Last in the Great Bear's Tail</i> —————	2	13	35	50	33 N
<i>Arcturus</i> —————	1	14	05	20	26 N
<i>South Ballance</i> —————	2	14	38	15	02 S
<i>Foremost Guard</i> —————	2	14	49	75	10 N
<i>Brightest of the Crown</i> —————	2	15	25	27	32 N
<i>Brightest in the Serpent's Neck</i> —————	2	15	32	07	11 N
<i>Antares, the Scorpion's Heart</i> —————	1	16	15	25	53 S
<i>Head of Hercules</i> —————	3	17	04	14	40 N
<i>Ophiuous, or Serpent's Head</i> —————	3	17	24	12	45 N
<i>Lyrae, or the Harp</i> —————	1	18	29	38	34 N
<i>Swan's Bill</i> —————	3	19	21	27	29 N
<i>Vulture, or Eagle's Heart</i> —————	2	19	39	08	15 N

H 2

Swan's

Swan's Tail	2	20	33	44	26	N
Mouth of Pegasus	3	21	32	8	47	N
Fomelhaut	1	22	44	30	53	S
Marchab, or Pegasus's Wing	2	22	53	13	55	N
Scheat, or Pegasus's Leg	2	22	48	26	45	N
Cepheus's Knee	3	23	20	76	7	N
Andromeda's Head	2	23	56	27	45	N

The Explanation and Use of the Table of the Sun's Right-Ascension, and of the Table of the Star's Right Ascension and Declination.

IN the Table of the Sun's Right Ascension, the first Page contains the first six Months of the Year; the next Page the other six Months; at the Head of the Table are the Months; in the first Column towards the Left-hand are the Days of the Month, and in the opposite Column is the Right Ascension in Hours and Minutes.

In the Table of the Fixed Stars, there are four Columns; in the first towards the Left-hand, are the Names of the Stars; in the second, the Star's Magnitudes; in the third, the Right Ascension in Hours and Minutes; in the fourth, their Declination in Degrees and Minutes, North or South.

First, To find the Time of a Star's coming upon the Meridian.

The Rule. Look the Right Ascension of the Sun and Star, and subtract the Right Ascension of the Sun from the Right Ascension of the Star, but if the Star's Right Ascension be less than the Sun's, add thereto 24 Hours, and then subtract; the Remainder after Subtraction, is the Time of the Star's coming upon the Meridian from Noon; but if the Remainder exceed 12 Hours, subtract 12 Hours therefrom, and then the Remainder is the Time from Midnight.

Example 1. Suppose the Time that *Fomelhaut* comes upon the Meridian on the 21st of *October* is required.

I find in the Table that Star's Right Ascension to be 22 Hours 44 min. and the Sun's to be 13 Hours 44 min. which subtracted from the Star's Right Ascension, leaves 9 Hours 00 min. the Time of the Star's coming upon the Meridian, Afternoon.

Example 2. Suppose the Time that the *Bull's Eye* comes upon the Meridian on the 26th of *October* was required.

I find the Star's Right Ascension to be 4 Hours 22 min. the Sun's 14 Hours 3 min. Now because the Sun's Right Ascension is more than the Stars, add to the Star's Right Ascension 24 Hours, which makes 28 Hours 22 min. from which subtracting the Sun's Right Ascension 14 Hours 3 min. there remains 14 Hours 19 min. from which subtracting 12 Hours, there remains 2 Hours 19 min. which is the Time of the Star's Southing after Midnight, as was required.

Secondly, The Time being given, to find what Star will come to the Meridian about the same Time?

The

The Rule. To the Sun's Right Ascension, add the Time from Noon, at which the Star's coming to the Meridian is desired; the Sum is the Right Ascension of the Star that will come to the Meridian at that Time; with which enter the Table of the Star's Right Ascension and Declination, where look what Star's Right Ascension agrees with the Right Ascension before found, or nearest thereto, and that is the Star sought for.

Example. Suppose *April* the 7th, I desire to know what Star will come upon the Meridian about 8 at Night.

The Sun's Right Ascension is 1 Hour 5 Minutes; the Time from Noon is 8 Hours, which added to the Sun's Right Ascension, makes 9 Hours 5 Minutes; the nearest in the Table is *Hydra's-Heart*, whose Right Ascension is 9 Hours 16 Minutes, and therefore Souths at 8 Hours nearly, and so in others.

Directions for observing the Stars, to find the Latitude of the Place.

Having before shewn how to find the Time of the Star's coming to the Meridian, I shall now shew, by the Stars Altitude, how to find the Latitude.

Note. In North Latitude, those Stars whose North Declination exceed the Complement of that Latitude may be observed under the Pole, and the same may be performed by the Southern Stars in South Latitude.

Particular Directions for finding the Latitude, by the Meridian Altitude of the fixed Stars.

Rule 1. If the Star comes to the Meridian in the South, and hath North Declination, the Complement of the Meridian Altitude or Zenith Distance, (by Observation) added to the Declination of the Star, found in the Table of the Star's Right Ascension and Declination, gives the Latitude North.

Example. On the 21st of *January*, being at Sea, I find by the foregoing Directions, that the *Lyon's-Heart* comes to the Meridian in the South, at 1 Hour 40 min. after Midnight; the Meridian Altitude by Observation was 63 Degrees; which subtract from 90 deg. there remains 27 deg. the Complement of the Altitude; to which adding 13 deg. 8 min. the Declination of the Star North, gives 40 deg. 8 min. the Latitude of the Place North, which was required.

Rule 2. If a Star comes to the Meridian in the South, and hath South Declination, subtract the Declination from the Complement of the Altitude, and the Remainder is the Latitude North: But if the Declination exceed the Complement of the Altitude, subtract the Complement of the Altitude therefrom, and the Remainder is the Latitude South.

Example 1. Suppose on the 21st of *July*, being at Sea, the Star *Fomel-haut* cometh to the Meridian in the South, at 2 Hours 41 min. after Midnight, the Merid. Alt. 35 deg. 50 min. the Comp. whereof is 54 deg. 10 min. the Star's Declination is 30 deg. 53 min. South, which subtracted from the Complement of the Alt. leaves 23d. 17m. which is the Latitude North.

Example

Example 2. Suppose on the first of *July*, being at Sea, the *Scorpion's Heart* comes to the Meridian in the South at 9 Hours 34 min. at Night, the Complement of the Altitude is 5 deg. 27 min. the Declination 25 deg. 53 min. South, from which subtracting the Complement of the Altitude, there remains 20 deg. 26 min. which is the Latitude, South.

Rule 3. If a Star comes to the Meridian in the North, above the Pole, and hath North Declination, subtract the Declination from the Complement of the Altitude, the Remainder is the Latitude South: But if the Declination exceeds the Complement of the Altitude, subtract the Complement of the Altitude therefrom, the Remainder is the Latitude, North.

Example 1. On the 22d of *June*, the *brightest in the Harp* comes to the Meridian in the North at 25 min. after Midnight, the Complement of the Altitude is 79 deg. from which subtracting the Declination, which is 38 deg. 34 min. North, there remains 40 deg. 26 min. which is the Latitude, South.

Example 2. On the 22d of *September*, *Andromeda's-Head* comes to the Meridian in the North at 11 hours 58 minutes at Night, the Complement of the Altitude is 7 deg. 10 min. which subtracted from the Declination 27 deg. 45 min. gives 20 deg. 35 min. which is the Latitude, North.

Rule 4. If a Star comes to the Meridian in the North, and hath South Declination, the Complement of the Altitude added to the Declination gives the Latitude, South.

Example. On the 23d of *December*, (*Syrius, or the Great Dog's Mouth*) comes to the Meridian in the North at 27 Minutes after Midnight, the Complement of the Altitude is 30 deg. to which adding 16 deg. 24 min. the Declination South, gives 46 deg. 24 min. the Latitude, South.

Rule 5. If a Star comes to the Meridian, under the Pole, then add the Complement of the Declination to the Meridian Altitude, the Sum is the Latitude either North or South, according to the Stars Declination.

Example. On the 21st of *March*, the Pole Star comes to the Meridian under the Pole at 41 min. after Midnight, the Meridian Altitude 44 deg. 30 min. the Complement of the Declination 1 deg. 59 min. which added together, gives 46 deg. 29 min. which is the Latitude, North.

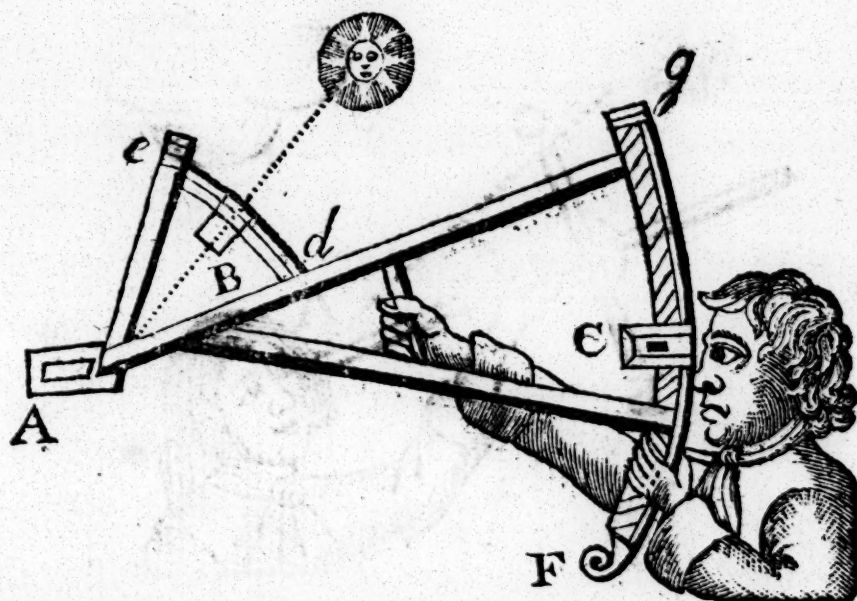
Rule 6. If a Star be in the Zenith, the Declination is the Latitude, either North or South, according to the Declination of the Star.

Rule 7. If the Star has no Declination, the Complement of the Meridian Altitude is the Latitude of the Place either North or South, according as the Observer is to the Northward or Southward of the Star.

The Description and Use of the Sea-Quadrant.

THIS Instrument consists of three Vanes and two Arches, the Horizon Vane, which in observing, respects the Horizon, as at A; the Shade Vane, so called, because of its giving the Shadow upon the Horizon Vane, in Time of Observation, as at B; besides this Shade Vane, there is another now in Use, having a Convex Glass properly fixed therein, which throws a lucid Point upon the Line of Direction in the Horizon Vane, and

is of great Service in gloomy Weather, when the Rays of the Sun are too weak to produce a distinct Shadow, by the former ; (But the only Instrument for this Purpose, and far superior to any other now in Practice, is HADLEY's Quadrant ;) Lastly, the Sight Vane, which in Time of Observation is placed at the Eye, through which the Shadow (or lucid Point) and Horizon are seen, as at C. The lesser of the Arches mark'd with *d e*, is called the Sixty-Arch, because it contains 60 (or more commonly of late 65) Degrees : In Time of Observation the Shade Vane is placed upon this Arch always to an even Degree ; it is numbered from the upper End at *e*, downwards to *d*, with 5, 10, 15, 20, &c. The bigger Arch marked with *g f*, is called the Thirty-Arch, because it contains 30 (or rather 25) Degrees, and is divided into Degrees and Minutes.

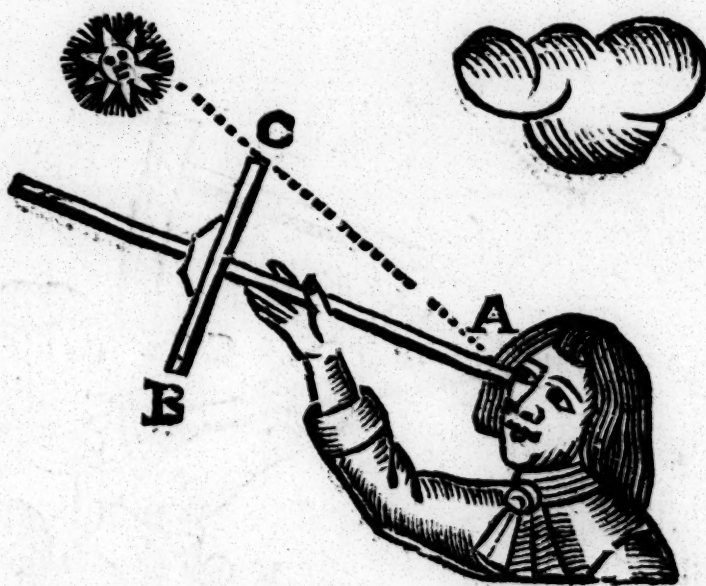


The Use of this Instrument is to take the Sun's Meridian Altitude, which is done in the manner following.

Put the Horizon Vane upon the End of the Quadrant at A, the Shade Vane upon the Sixty (or lesser Arch) to a Number of Degrees, less than the Complement of the Altitude by 15 or 20d. and the Sight Vane upon the Thirty-Arch: The Vanes being thus fixed upon the Quadrant, your Back being turned to the Sun, and the Sight Vane placed to the Eye, look thro' the said Sight Vane, and cause the Shadow of the upper Edge of the Shade Vane (or lucid Point in the Glass Vane) to fall upon the upper Part of the Slit in the Horizon Vane, where usually (for Perspicuity-sake) there is drawn a black Line or Line of Direction ; and if at the same Time the Horizon appear thro' the said Slit in the Horizon Vane, you have then the Sun's present Altitude, or Zenith Distance ; but if the Sea appear instead of the Horizon, then slide the Sight Vane lower towards F ; if the Sky appear instead of the Horizon, then slide the Sight Vane a little higher until the Horizon appear thro' the Horizon Vane: But to obtain the Meridian

Altitude

Altitude, (which is the greatest Altitude the Sun will have tha Day, and is the Thing used to find the Latitude,) continue observing, and as the Sun rises, the Sea will appear through the Horizon Vane ; then must the Sight Vane be removed lower ; And thus continue observing, as often as may be convenient till the Sun be at the highest, which is the Meridian Altitude : When the Sun begins to fall, the Sky will appear instead of the Horizon, and then it's Time to give over observing for that Day : Having thus done, add the Degrees upon the Sixty Arch to the Degrees and Minutes upon the Thirty Arch, and the Sum is the Complement of the Meridian Altitude ; the Use of which for finding the Latitude, is sufficiently shewn in the preceding Rules.



Description and Use of the Cross-staff, or Fore staff.

THIS Instrument consists of a Staff and four Crosses, the first and shortest is called the Ten Cross, and belongs to that Side of the Staff which is numbered from about 3 Degrees to 10 Degrees ; Sometimes the Thirty Cross, and the rest of the Crosses are so made, as that the Breadth of any of them may serve instead of this Ten-Cross.

The second Cross is called the Thirty-Cross, and belongs to that Side of the Staff which is numbered from about 10 Degrees to 30.

The Third Cross is called the Sixty-Cross, and belongs to that Side of the Staff which is numbered from about 20 to 60 Degrees.

The Fourth and last Cross is called the Ninety-Cross, and belongs to that Side of the Staff, which is numbered from about 30 to 90 Degrees.

This Staff is likewise numbered with the Complement to 90 Degrees, (viz.) at 10 stands 80, at 20 stands 70, at 30 stands 60 ; and so of the rest.

The Use of this Instrument is to take the Meridian Altitude of the Sun or Star, which is performed as followeth.

First,

First, Consider how great the Sun's Meridian Altitude will be that Day; and accordingly use the Cross most suitable, (*viz.*) if the Meridian Altitude be judged to be under 10 deg. use the Ten-Cross; if between 10 and 30, the Thirty-Cross; if between 30 and 60, the Sixty-Cross; if between 60 and 90, the Ninety-Cross, which is seldom used.

Having put on the Cross, place the flat or square End of the Staff at A, to the Outside of the Eye, as near as may be, without hindering the Sight; thus the Face being towards the Sun or Star, hold the Cross upright; then look at the upper End of the Cross, at C, for the Sun or Star, and at the lower End at B, for the Horizon, and if the Sea appear instead of the Horizon, remove the Cross a little further from the Eye; but if the Sky appear instead of the Horizon, remove the Cross a little nearer to the Eye, until the Sun or Star appear at the upper End, and the Horizon at the lower End; which when they do, then upon the Side of the Staff belonging to the Cross then in Use, will be found the deg. and min. of Altitude of the Sun or Star. But the greatest Altitude being that which is required, Observation must be continued as frequently as Judgment shall direct, until the Sun or Star be at the highest; and as the Sun or Star rises, the Sky will appear instead of the Horizon; but when the Sun or Star is past the Meridian, and begins to fall, the Sea will appear instead of the Horizon, and then is the Observation finished; and upon the Side of the Staff proper to the Cross used, are found the Degrees and Minutes of the Sun's Meridian Altitude; which subtracted from 90 deg. gives the Complement of the Altitude; or it may be taken off the Staff at once (the Staff being numbered with the Complement as shewed before) with which to proceed in finding the Latitude of the Place, observe the Rules and Directions foregoing.

The Description and Use of the Nocturnal.

IT consists of three Parts, the first an unmoveable Part, on which is the Handle, by which to hold it in Time of Observation; upon the fore-side of which, in the outermost Circles are the Days of the Month, upon the innermost are set off the 24 Hours, and upon the Back-side are the 32 Points of the Compass.

There are two sorts of *Nocturnals*, the one made for the *Great-Bear*, the other for the *Little-Bear*. Those that are made for the *Great-Bear* have *February* at the Top, but those that are made for the *Little-Bear* have *April*, but now they are commonly made for both *Bears*, having two Indices.

The second, or middle Part contains two Circles, and the aforesaid Indices, one marked G, for the *Great-Bear*, and the other marked L, for the *Little-Bear*. The outermost Circle is divided into 29 Days and an half, the Moon's Age; the innermost into 24 Hours, the Index belonging to the *Bear*, you intended to observe by, is to be set to the Day of the Month at pleasure.

The third and upper Part is a long Index; the Edge of which (respecting the Center) must be turned to the Guards or Pointers, in Time of Observation.

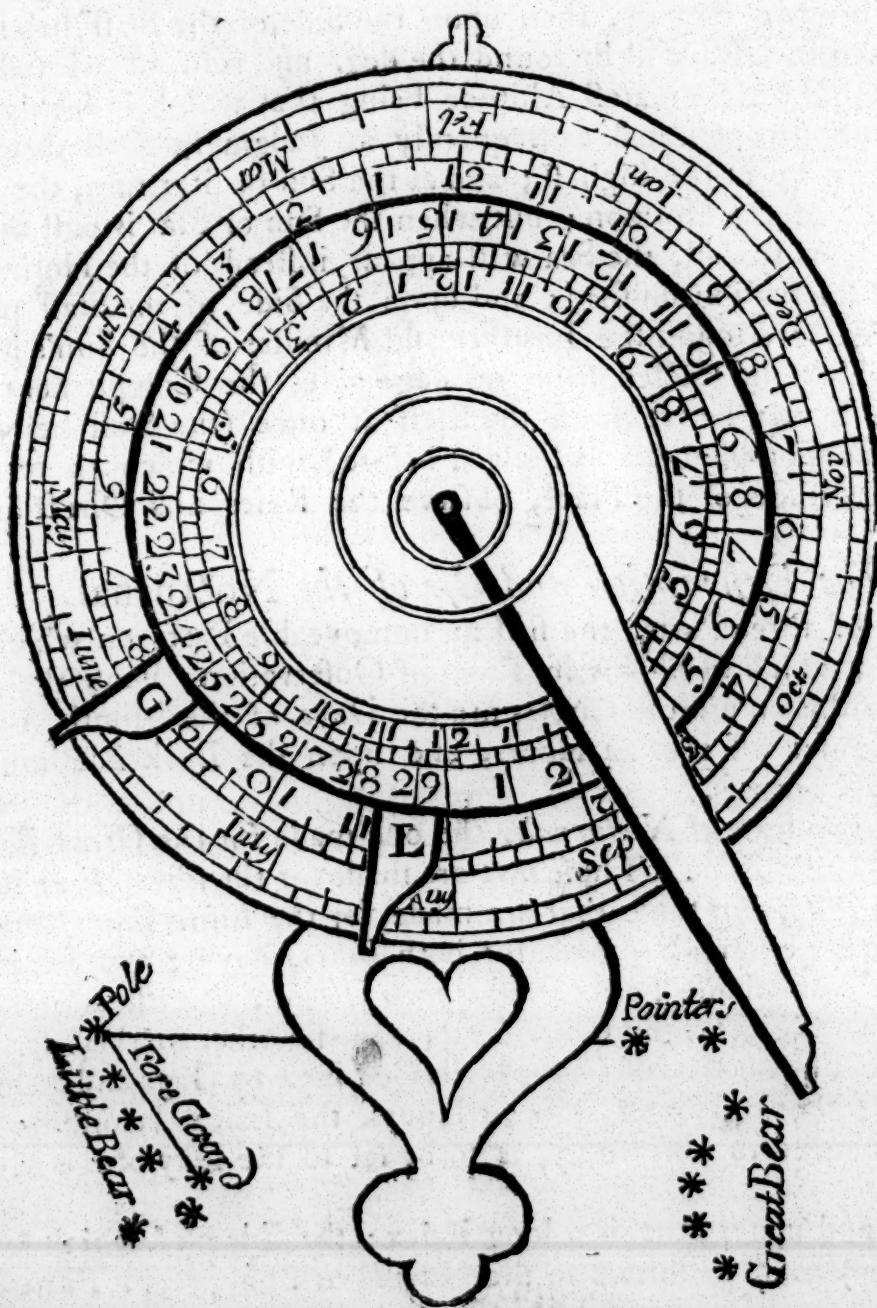
The Description of the Nocturnal.

Note, That by the Alteration of the Stile, the present Nocturnals are render'd erroneous, in such Examples as refer to the Days of the Month; but these Errors are easily adjusted, by reckoning and fixing the Index of the Instrument eleven Days backwards from the Day of Observation; in like Manner as is directed, and done in the Example following.

To find the Hour of the Night, and upon what Point of the Compass the Guards are.

To do this, First, set the Index of the middle Part to the Day of the Month, then hold the Instrument upright, which may be discerned by the Tip on the Top of the *Nocturnal*, then look through the Hole in the Mid-

The Figure of the NOCTURNAL.



dle of the *Nocturnal*, for the North Star; which having found, turn the Edge of the long Index to the Guards or Pointers, according as you observe the *Little* or *Great Bear*, then shall the Edge of the Index (upon the innermost Circle of the middle Part) give the Hour of the Night.

Also in *Nocturnals* made for both Bears, you have on the Back-side two Circles mark'd at the Bottom, the outermost with L, and the innermost with G; and numbered round with Degrees and Minutes, for finding how much the *Pole Star* is above or below the true Pole; to find which, having fitted the *Nocturnal* as before directed; observe what Figures on the Back-side fall under the Edge of the long Index, in the Circle belonging to the Bear by which you observe, and that is the deg. and min. that the Star is above or under the Pole, as is distinguished by the Words *Abo.* and *Und.*

Ex. To observe by the *Gr. Bear*, *July 6. New-Style*, which answers to *June 25th, Old-Style*; reckoning eleven Days backwards, I set the Index marked G to *June 25*, and looking through the Hole to the Pole, I turn the long Index, till it lie just over the two Pointers, as you see in the Figure of the *Nocturnal*, and find on the innermost Circle of the middle Part of the *Nocturnal*, that it is Two o'Clock in the Morning; and on the Back-side in the Circle mark'd G, I find the Pole Star is 2 deg. 26 min. above the Pole, on the 6th of *July, New-Style*, or according to the present established Account: But the Bearings known, the Elevation or Depression of the North Star, above or below the Pole, is found by the following Table.

To find the Moon's Southing, and Time of Full Sea by the Nocturnal.

TO do this, it is but looking upon the middle Piece of the *Nocturnal*, and in the outmost Circle find the Moon's Age; and opposite to it in the innermost Circle of the same Piece stands the Southing.

Ex. Suppose the Moon 25 Days old, and the Time of her Southing req.

Look for 25 the Moon's Age in the outermost Circle, opposite to which in the innermost Circle stands 8, which is the Moon's Southing at 25 Days old required.

Note, That always between the Change and the Full, the Moon comes to South in the Afternoon, but after the Full in the Morning.

Thus having found the Moon's Southing, add thereto the Time of Flowing upon the Full and Change Days at any Place, and that gives the Time of Full Sea when required. But this has been sufficiently shewed in another Place, and therefore needs no Example.

The Use of the following Table of the Declination of the North Star.

THE Use of the Table is this: Having taken the Alt. of the Pole Star, then observe with the *Nocturnal* upon what Point of the Compass the Guards are; opposite to which in this Table stands the Declination (so called) which if the Star be below the Pole, is to be added to the Altitude, but if the Star be above the Pole, to be subtracted therefrom, to find the Latitude of the Place.

But the more exact Way to find the Latitude, is by those other Directions for the Stars before given, which is to be depended upon preferable to this last Method, but solar Meridional Observations sepeior to all.

A Table of the Declination of the North Star, on every Point of the Compass the Guards bear, and for both Sorts of Nocturnals.

If the former of the Guards be ascending from the North or lower Part of the Meridian.	Points of the Compass.	For the Fore-Guard of the Little Bear.		If the after Wheel, or two Pointers be ascending from the North, or lower Part of the Meridian.	For the Guards of the Great Bear, called the two Pointers.	
		D.	M.		D.	M.
If the former of the Guards be descending from the South, or upper Part of the Merid.	North	2	9	Above the Pole	2	20
	N by E	1	52		2	30
	N N E	1	29		2	35
	N E by N	1	2		2	33
	North East	0	35		2	26
	NE by E	0	6		2	13
	E N E	0	22	The North Star is under the Pole	1	55
	East by North	0	52		1	33
	East	1	18		1	7
	East by South	1	41		0	38
	E S E	2	01		0	8
	S E by E	2	16		0	22
	South East	2	25		0	52
	S E by S	2	30		1	20
	S S E	2	29		1	44
	South by East	2	22		2	4
	South	2	11		2	20
	South by West	1	55		2	30
	S S W	1	34		2	29
	S W by S	1	10		2	27
	South West	0	43		2	23
If the two Pointers be descending from the South or upper Part of the Merid.	S W by W	0	14		2	13
	W S W	0	15	Above the Pole	1	55
	West by South	0	44		1	33
	West	1	11		1	07
	West by North	1	36		0	38
	W N W	1	58		0	8
	N W by W	2	14	Ab. the Pole	0	22
	North West	2	25		0	52
	NW by N	2	30		1	20
	NNW	2	29		1	44
	North by West	2	22		2	04

A Table of the Latitudes and Longitudes of the principal Harbours, Headlands, and Islands in the World; Corrected by the latest and best Observations; the Longitude reckoned from the Meridian of L O N D O N.

Note, *When the Latitude and Longitude of an Island is given, the middle of the Island is meant, except some particular Part of it is expressed.*

Places Names.	Latitude North	Longit E or W	Places Names.	Latitude North	Longit. E or W.
The Coast of England.	D. M.	D. M.		D. M.	D. M.
B erwick ———	55 48	01 45 W	North Part of	North Latitude.	West Longitude
Newcastle ———	55 12	01 30 W	Lewis Island — }		
Stockton ———	54 33	01 25 W	St. Kilday ———		
Spurn ———	53 45	00 13 E	Farro Head ———		
Yarmouth ———	52 40	01 38 E	Northern Isles of		
LONDON ———	51 31	00 00 E	Orkney ——— }		
North Foreland —	51 25	01 24 E	Shetland S. Point —		
Beachy ———	50 46	00 25 E	Buchanefs ———		
Dunnose Isle Wight	50 38	01 24	Aberdeen ———		
Portland ———	50 30	02 44	Dundee ———		
Start Point ———	50 07	03 47	Edenburgh ———	55 58	02 59
L I Z A R D ———	49 57	05 14	The Coast of Ireland.		
Land's-end ———	50 06	06 00	Dublin ———	53 12	06 56
St. Mary Scilly —	50 00	06 46	Wexford ———	52 13	07 27
Hartland Point —	51 06	04 35	Waterford ———	52 09	08 40
Lundy Isle ———	51 20	04 40	Cork ———	51 49	09 30
Bristol ———	51 33	04 35	Cape Clear ———	51 17	11 10
St. David's Head —	51 00	05 22	Limrick ———	52 23	09 35
Barfeyor Bardsey Isle	52 44	05 00	Galway ———	53 07	09 40
Holy-head ———	53 24	04 50	Sline Head ———	53 20	11 15
Liverpool ———	53 20	03 00	Londonderry ———	55 00	07 50
Whitehaven ———	54 17	03 30	Belfast ———	54 39	06 30
Carlisle ———	54 47	03 05	The Coast of Holland and Flanders		
The Coast of Scotland.			Scaw ———	57 30 N	10 20 E
Glasgow ———	55 52 N	04 05 W	Helighland ———	54 24 N	08 35 E
N. Part of Sky Isle	57 45 N	05 45 W			Ham.

A Table of Latitude and Longitude.

Places Names.	Latitude North		Longit. E. or W.	
	D.	M.	D.	M.
Hambrough	53	41	10	35
Emden	53	05	07	35
The Fly	53	15	05	30
The Texel	53	15	05	10
Amsterdam	52	23	05	04
Rotterdam	51	55	04	30
The Brill	52	00	04	00
Sluys	51	14	03	43
Calais	50	58	01	54

The Coast of France and Portugal.				
Places Names.	Latitude North		Longit. E. or W.	
	D.	M.	D.	M.
Dieppe	49	56	01	09 E
Cape de Hogue	49	47	02	00
Caskets	49	50	02	20
Guernsey	49	33	02	40
St. Maloes	48	39	01	57
Morlaix	48	33	03	49
Ushant	48	30	05	02
Brest	48	23	04	25
Penmark	47	48	04	24
Bell Isle	47	18	03	16
Nantz.	47	14	01	39
Island Dieu	46	34	02	13
Island Ree	46	10	01	30
Rochel	46	10	01	11
Bordeaux	44	50	00	38
Bilboa	43	29	02	58
Cape Ortegal	44	04	07	48
Cape Finister	43	12	09	40
Port a Port	41	10	09	25
Burlings	39	35	09	24
Rock of Lisbon	38	52	09	50
Lisbon	38	42	08	53
Cape St. Vincent	36	53	09	06
Cadiz	36	33	06	01
Cape Trefalgar	36	10	06	01

The Coast on the Main Continent within the Straits				
Places Names.	Latitude North		Longit. E. or W.	
	D.	M.	D.	M.
Gibraltar	36	12 N	04	53 W
Cape de Gat	36	40 N	01	40 W

Places Names.	Latitude North		Longit. E. or W.	
	D.	M.	D.	M.
Cape Paul	38	13	00	05
Cape St. Martin	38	46	00	40
Barcelona	41	26	02	18
Marseilles	43	18	05	27
Toulon	43	07	06	02
Genoa	44	25	08	43
Leghorn	43	28	10	35
Rome	41	54	12	45
Naples	40	51	14	46
Cape Spartavento	37	55	10	55
Cape Collonne	38	56	18	05
Gallipoli	39	56	18	43
Cape St. Mary	39	45	19	00
Ancona	43	40	14	26
Venice	45	25	12	10
Lepanto	38	10	22	52
Cape Matapan	36	33	22	41
Cape St. Angelo	36	32	23	56
Athens	37	58	24	05
Cape Martelo S.	38	07	25	03
P. of Negropont	40	26	25	02
Cape Monte Sancto	40	41	23	13
Salonica	40	33	27	20
Gallipoli	40	33	27	20
Constantinople	40	59	28	56
Smyrna	38	28	27	25
Ephesus	38	01	27	53
Antiochetta	36	30	32	46
Scanderoon	36	34	36	30
Aleppo	35	42	37	24
Tripoli	34	38	36	15
Alexandria	31	10	30	19
Cape Rufato	32	48	21	25
Cape Mesurato	32	21	16	17
Tripoly	32	54	13	10
Cape Bona	37	03	11	04
Bona	36	52	08	19
Algier	36	50	03	16
Cape de tres forcas	35	30	02	04 W
Tetuan	35	27	05	06 W
Ceuta	35	54	04	45 W
Tangier	35	42	05	22 W

Aboran

A Table of Latitude and Longitude.

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Places Names.	Latitude North		Longit. E. or W		Places Names	Latitude N. or S		Long. E. or W	
	D.	M.	D.	M.		D.	M.	D.	M.
Islands within the Straits.									
Alboran	35	54	02	29W	Cape de Verde	14	43	17	20
Formentura	38	33	01	55	River Gambia	13	08	15	31
Yvica	38	50	01	40	Sierraleona	08	36	12	57
Majorca	39	30	03	03	Mezsurado	06	05	10	02
Minorca City	39	51	04	52	Cape Palmas	04	13	06	45
Port Mahon Minorca	39	42	04	12	Jaque Jaque	04	16	09	47
Gallitta	37	41	08	44	Aflene	04	15	07	17
Sardinia South End	38	46	09	12	Cape 3 Points	04	28	01	50
Corfica North End	42	56	09	50	River Volta	05	55	03	25
Gorgona	43	34	09	38	River Formosa	07	00	07	20
Captia	43	03	10	17	Cape Formosa	04	15	06	40
Lilboa, or Elba	42	45	11	00	New Calabar	04	42	08	33
Messina	38	07	16	20	Old Calabar	04	10	09	45
Maritimo	38	12	17	09	River Camerones	03	25	10	10
Cape Pailaro	36	38	15	40	River de Angra	00	50	10	01
Malta	35	53	14	32	Lopas	00	55	09	55
Corfu	39	42	20	06	River Congo	05	40	15	25
Chephalonia	38	15	21	00	Angola	08	57	15	56
Zante	37	46	21	14	Cape Negro	16	08	12	31
Modon or Morea	36	52	21	32	Cape St. Thomas	24	10	14	43
Lemnos	39	59	25	37	Secos	29	00	15	56
Scio	38	22	26	12	C. Bona Esperance	34	07	19	35
Lissa	43	06	16	40	Western Islands.				
C. St. John West	35	15	24	00	Corvo	39	54	30	55
end of Candy					Flores	39	32	30	54
Cape Solomon, E	35	00	27	08	Fyal	38	53	28	15
end of Candy					Pico	38	40	27	20
Rhodes City	36	42	28	05	St. George	38	52	26	03
West end of Cyprus	34	57	32	23	Tercera	38	57	25	34
East-end of Cyprus	35	31	35	00	St. Michael	38	06	23	36
The Coast of Barbary and Guiney.					St. Maries	36	50	23	38
Cape Spartel	35	50	05	49	The Canary Islands.				
Sallee	33	51	06	25	Ferro	27	54	17	45
Cape Cantin	32	36	09	10	Palma	28	40	17	36
Cape de Geer	30	27	10	06	Gomero	28	06	17	05
Cape Bajadore	26	04	15	35	Teneriff	28	23	16	28
Cape Olerado	23	41	15	50	Madeira West end	32	44	17	26
Cape Blanco	20	32	17	35	Porto Sancto	33	12	15	54
Senegall	15	28	16	25	Canaria	27	52	15	10
					Forteventura SW.	28	05	13	36
					Lancerora	29	02	12	45

West Longitude

East Longitude

West Longitude

West Longitude

North Latitude

South Latitude

North Latitude

North Latitude

A Table of Latitude and Longitude.

Places Names.	Latitude N. or S.	Longit. E. or W	Places Names	Latitude N. or S.	Longit. East
Cape de Verde Islands.	D. M.	D. M.		D. M.	D. M.
St. Antonio	17 35	24 40	Diu Point	16 08	81 32
St. Vincent	17 15	24 25	Vifagapatam	17 43	83 57
St. Lucia	17 07	24 20	Cape Palmiras	20 42	87 52
St. Nicholas	17 00	23 38	Ballafore Road	21 16	87 48
Brava's	14 28	23 54	Bengal	22 17	92 21
Fuego	14 50	23 35	Cape Negrais	26 23	93 00
St. Jago	15 08	22 45	Malacca	02 12	102 10
Isle of May	15 14	22 08	Siam Entrance	14 18	100 55
Isle of Sal	16 50	22 08	Cambodia Entrance	10 28	105 00
Bonavista	16 05	22 08	Cochin	14 05	107 56
Southern Islands.			Macao	22 13	113 51
St. Matthew's	01 30 S	06 01 W	Canton	23 14	113 06
Ascen on	07 40 S	14 05 W	Amoy or Quemoy	24 35	116 50
St Helena	16 00 S	06 04 W	Laimpo	29 59	120 35
Fernande Poo	02 40 N	10 30 E	Nanquin	33 07	120 01
Princeps	01 40 N	09 15 E	Islands in the East-Indies.		
St. Thomas	00 00	08 20 E	Madagascar } S end	25 47	46 10
Annabona	02 10 S	07 27 E	St Laurence } Nend	12 10	51 05
The Coast on the Main Continent in the East Indies.			Mayetta	13 10	45 38
Cape Lagullas	34 54 S	21 20	Mohilla	12 05	44 23
Cape Bon Esperance	34 07 S	19 35	Comero	11 40	43 50
Cape Corientes	23 40 S	36 17	Juan de Nova	09 30	52 40
Mofambique	15 04 S	41 10	Mauritius	20 10	52 55
River de Fuegos	00 41 S	41 15	Diego Royes	19 50	61 30
Cape Bassos	04 06	47 38	Romeras de Castela	28 45	67 17
Cape Guardefoy	11 44	51 20	Amsterdam [m s	38 40	72 45
Cape Rafulgat	22 41	59 45	St. Brandon	16 38	64 30
C. Muca or Muscat	23 32	59 45	Diego Gratiofa	08 40	68 25
Buero	29 45	49 20	Quabella	03 53	52 30
Surat	21 10	72 25	Baffas de Chagos	06 55	68 45
Goa	15 31	73 50	Yas de Diego Reys	00 20	72 00
Calicut	11 16	75 30	Maldivia } Nend	07 14	73 04
Cochin	09 54	75 55	Maldivia } S. end	00 25	76 22
Cape Comerine	07 50	77 25	Malique	09 00	72 58
Egri St. George	13 11	80 32	Sacatra	12 21	54 05
			Abdeleur	12 04	53 04
			C. Gallode Zeylone	06 08	81 15

A Table of Latitude and Longitude.

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Places Names.	Latitude N. or S		Longit. E. or W		Places Names.	Latitude N. or S.		Longit. West		
	D.	M.	D.	M.		D.	M.	D.	M.	
Yas de Amber —	00	00	Latitude	52 30	Bay Bonaventuro —	03	24 N	78	06	
Andaman —	11	10		73 19	Island Gallopega —	00	00	90	10	
Nicobar —	07	11		93 40	Cape del Ajuga —	06	30	84	50	
Sumatra NW. End —	05	22		94 50	Lima —	12	15	77	30	
Verkin's Island —	02	22		94 07	Arica —	18	29	73	10	
Nassau Island —	02	54		99 32	La Serena —	29	00	76	22	
Bencola —	03	55		104 08	I. Juan Fernandes —	33	15	83	18	
Sumatra SE. End —	05	22		105 10	Baldivia —	39	35	81	10	
Engano or Trompeus —	05	50		101 43	Port Steven —	46	50	82	36	
Selam —	08	20		102 13	Cape Victory —	52	00	83	10	
Princes Island —	06	30	104 02	Cape Horn —	56	35	79	55		
Bantam in Java —	06	11	105 55	The Coast of Brazile in South America, from Cape Horn to Cape Roque.						
Batavia —	06	16	106 46							
Java East End —	08	32	113 30	Magellan E. entran.	52	00	75	05		
Straits of Sundy —	06	02	105 46	River Julian —	48	40	74	34		
Banca South End —	03	20	106 45	Cape Blanco near }	46	50	72	07		
Borneo South Point	03	54	113 37	R. Camarones }						
Banda Isles —	04	55	127 17	Buenos Aires R. Plata	34	35	57	54		
Celebes { South end	05	10	119 07	River Grand —	31	55	52	00		
{ N. end —	01	40	121 20	St. Catherine's —	27	50	49	00		
Mindano West point	06	40	119 15	Cape Frio —	23	00	42	20		
Borneo North Point	07	40	113 05	Spirito Sancto —	19	59	42	10		
Luconia { SW. poi	12	30	120 10	P. Segura —	16	31	40	35		
{ NE. poi.	18	55	120 05	Bay Todos Sanctos	12	46	41	00		
Anian { NW point	19	30	107 00	R. St. Francisco —	10	50	37	50		
{ NE. point	19	55	109 55	Olinda or }	07	48	35	30		
Formosa { S point	22	00	119 56	Pernambuco }						
{ N. point	25	30	120 45	Cape St. Augustine	08	35	35	20		
Piscadore Isles —	23	30	118 35	Cape Roque —	05	00	35	47		
Island Chusan —	30	38	120 35	Tristian D'Acunha	37	05	13	50		
Japan { S.E. point	35	30	140 30	Trinidad —	20	30	30	00		
{ S.W. point	35	00	128 30	The Coast of the Main Continent in the West-Indies.						
The Coast of America in the South Sea, from California to Cape Horn.				R Amazonas Entr	00	00	49	56		
				North Cape —	02	05	49	56		
Cape St. Sebastian —	42	45	Latitude	127 55	Suranam —	06	25	56	50	
Cape Lucas or Lucar	23	20		111 46	Oronoque —	08	15	59	25	
Cape Corientes —	18	50		110 30	C. Conquibaca —	12	40	70	42	
Aquapulco —	17	05		104 18	Carthagenia —	10	28	75	21	
Aquatulco —	15	27		102 03	Scot's Settlement —	08	30	73	45	
Guatimala —	14	25		101 00	Nicaragua Entrance	11	25	84	15	
Panama —	08	50		81 52	Cape Catocha —	21	20	80	01	

A Table of Latitude and Longitude.

Places Names.	Latitude North		Longit. West.		Places Names.	Latitude North		Longit. West.	
	D.	M.	D.	M.		D.	M.	D.	M.
Campecha ———	19	30 N	92	10 W	Bahama Island ———	26	50	79	36
La Vera Cruz ———	19	12 N	97	48 W	Abaco S. Point ———	26	00	73	46
Mexico ———	20	00 N	103	35 W	Harbour Island ———	25	37	76	47
Escondido ———	30	20 N	89	30 W	Andros N. Point ———	25	10	78	50
Cape Florida ———	24	57 N	80	30 W	Providence ———	25	00	77	20
The Caribbee Islands.					Eleuthera S. point ———	24	40	75	56
Trinidad ———	10	15	60	17	Cat Island ———	24	25	75	09
Tobago W. End ———	11	10	59	10	Watling's Island ———	24	03	74	35
Granado ———	11	57	60	20	Rum Key ———	23	45	74	50
Barbadoes ———	22	58	58	50	Exuma ———	23	22	75	55
St. Vincent ———	13	12	60	12	Crooked Isle N. point } North Latitude	22	56	74	12
St. Lucia ———	13	55	60	04	Atkin's Key ———	22	17	74	05
Martinico ———	14	43	60	54	Meraparovuz ———	21	58	74	45
Dominico ———	15	23	60	30	Atwood Keys ———	23	10	73	35
Marigallante ———	15	58	60	20	French Keys ———	22	40	73	40
Guardalupa ———	16	10	61	15	Mayaguana ———	22	35	72	46
Monferat ———	16	45	62	15	Hogfies ———	21	17	73	55
Antegua ———	17	05	61	45	Hyncago W End ———	20	52	73	46
Nevis ———	17	05	62	32	Caicos Bank ——— } West Longitude	20	50	71	15
St. Christopher's ———	17	17	62	40	N. point ——— }	21	35	70	08
Barbuda ———	17	56	60	40	Turk's Island ———	21	35	69	06
St. Bartholomew ———	17	52	62	06	Abrolho N. point ———	21	35	69	06
St. Martin's ———	18	06	62	10	Platewrack ———	20	10	68	15
Anguilla ———	18	17	62	13	The Coast of Carolina, Virginia, Maryland, Pennsylvania, New-England, and New-foundland.				
Virgin's ———	18	30	63	25					
St. Cruize ———	17	52	63	30					
Bique ———	18	00	63	15					
Porto Rico St John's ———	18	30	65	37					
St Domingo Hispan. ———	18	25	69	30					
P. Royal Jamaica ———	17	40	76	32					
East End of Cuba ———	20	15	73	55					
Havana ———	22	40	82	55					
Bay Hendy ———	22	45	83	40					
Cape St Antonio ———	21	45	85	32					
Bahama Islands.									
Bermudas ———	32	25 N	63	40 W	Charles Town ——— } North Latitude	32	45	78	46
N. Point ——— }	27	50 N	78	35 W	upon Ashly River }	35	15	74	20
Bahama Bank }					Cape Hatteras ———	37	00	75	24
					Cape Henry ———	37	16	74	16
					Cape Charles ———	38	50	74	56
					Cape Hinlopen ———	40	50	72	45
					Long Island ———	40	58	73	53
					New York ———				Cape

A Table of Latitude and Longitude.

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Places Names	Latitude North		Longit. West		Places Names.	Latitude North		Longit. E or W	
	D.	M.	D.	M.		D.	M.	D.	M.
Cape Cod ———	42	12	68	55	The Coast of Iceland, Greenland, Nova Zembla, and the Northern Isles.				
Boston Entrance —	42	30	69	23					
Cape Sable ———	43	50	64	58	Sound Royal ———	66	22	24	33
Island Sable ———	44	20	59	01		66	20	16	35
Cape Britain ———	46	00	58	30	Bargarer's Point —	65	27	20	33
Quebeck ———	46	55	69	48	Whales Back ———	63	25	17	05
Bay of Brest ———	52	10	56	57	Merchants Foreland	64	30	34	43
Bell Island ———	52	07	55	35	Halliford ———	66	20	26	27
Cape St. John ———	50	25	52	48	Fair Foreland ———	67	15	22	34
Cape Bonaville ———	49	15	52	12	Grim's Island ———	63	30	22	54
Trinity Bay Entr.	48	52	52	20	Westmania Isles —	62	06	05	00
Conception Bay En	48	20	52	08	Isles of Fero ———	71	45	04	30
St. John's Harbour	48	00	51	39	Beerenberg, or }	76	25	15	36
Bay of Bulls ———	47	50	51	29	John Main's Isle }	76	45	13	36
Cape Race ———	46	40	51	52	Point Lookout ———	79	20	10	52
Cape St. Mary ———	47	10	53	23	Horn Sound ———	79	55	11	00
Placentia Bay ———	47	45	53	58	Haeluit's Headland	78	55	21	50
Cape Roy ———	48	00	57	40	Helie's Sound ———	78	05	23	25
The Coast of Hudson's Bay and the Straits.					Lee's Foreland ———	77	18	21	30
					Whale's Head ———	76	18	23	45
Buttons Isles ———	60	25	66	27	Hope Island ———	74	30	18	08
Cape Charles ———	62	10	75	35	Cherry or Bear Isle	75	05	55	50
Cape Walsingham —	62	35	77	55	Admiralty Island —	70	00	61	20
Mansfield Isle ———	61	42	80	30	Fretum Borough ———	69	05	42	35
Cape Jones ———	54	55	78	58	Cape Candemose ———	65	43	35	14
Rupert's River ———	51	30	79	26	Carnose ———	64	30	40	30
Albany Fort ———	52	26	84	50	Archangel ———	66	31	36	33
The Cubb's ———	54	10	82	40	Cross Island ———	68	10	34	45
C. Henrietta Maria	55	07	84	30	Sweetnose ———	69	30	31	20
Port Nelson ———	57	10	93	58	Kilduyn ———	71	23	23	02
Cape Churchil ———	59	00	95	20	North Cape ———	71	05	16	40
C. Southampton ———	61	55	86	48	Surroy Isle ———	70	25	15	30
Shark Point ———	64	30	82	55	Tromsund ———	68	15	09	40
Nottingham Isle ———	63	30	79	53	Loefort SW. Point	63	40	10	15
Q. Ann's Foreland	63	48	74	45	Dronten ———	62	10	04	38
Resolution Isle ———	61	50	65	04	Stadland ———	60	10	05	40
Cape Farewell ———	59	45	46	45	North-bergen ———	57	45	07	24
					Naze of Norway ———				

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See

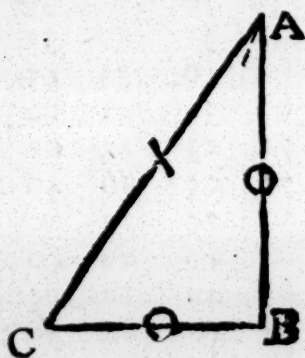
Places Names.	Latitude North.		Longit. East.		Places Names.	Latitude North.		Longit. East.	
Sea-Coast in the Sound, & Baltic Sea.	D.	M.	D.	M.		D.	M.	D.	M.
Maerden, or Mardel	58	19	08	57	Narva	59	27	28	25
Larwic	58	54	09	20	Revel	59	27	24	51
Christiana	59	40	10	00	Riga	57	04	25	15
Maesterland	57	53	11	45	Derwinda	57	15	22	06
Gottenberg Gat	57	50	12	15	Coningsburg	54	43	21	35
Elsenore	56	22	12	42	Dantzic	54	22	18	36
Rostock	54	37	18	40	Wisby in Gotland	57	30	18	30
Copenhagen	55	41	12	50	Bornholm	55	15	14	45
Valsterborn	55	28	13	00	Straelsund	54	25	13	16
Uraniburg	55	54	12	58	Lubec	54	06	09	55
Calmer	56	40	16	35	Anout, or Anholt	56	50	11	06
Stockholm	59	20	19	30	Lefou, or Lefnou	57	05	10	30
Wyburg	60	52	29	16	Scaw	57	30	10	20
Petersburg	60	00	30	25					

Problems of Plane Sailing, wrought by Logarithms, and by Gunter's-Scale.

PROBLEM I.

THE Course and Distance being given; to find the Difference of Latitude and Departure.

Example. Suppose a Ship sails South West by South 382 Minutes, and the Difference of Latitude and Departure are required.



In the Right-angled Triangle ABC.

AC represents the Distance sailed.

AB the Difference of Latitude.

BC the Departure.

BAC (or the Angle at A) the Angle of the Course.

ACB (or the Angle at C) the Complement of the Course to 90 deg.

Characters

Characters used in Navigation and Astronomy.

S. stands for Sine.

T. for Tangent.

S.c. Sine Complement. T.c. Tangent Complement.

The given Sides and Angles of a Triangle are marked with a dash (').

The required Sides and Angles with a Cypher thus (°.)

The Operation by Logarithms. For the Difference of Latitude.

As Radius	_____	_____	_____	_____	10.000000
To the Distance sailed 382 Minutes	_____	_____	_____	_____	2.582063
So is the S.c. of the Course 56d. 15m.	_____	_____	_____	_____	9.919846
To the Difference of Latitude 317.6 Minutes	_____	_____	_____	_____	12.501909

For the Departure.

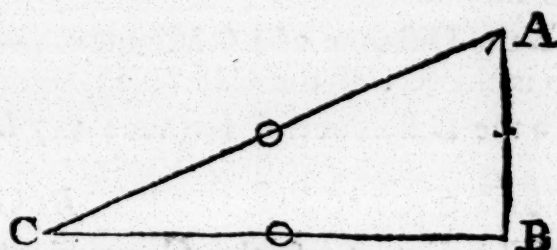
As Radius	_____	_____	_____	_____	10.000000
To the Distance sailed 382 Minutes	_____	_____	_____	_____	2.582063
So is the S. of the Course 33d. 45m.	_____	_____	_____	_____	9.744739
To the Departure 212.2 Minutes	_____	_____	_____	_____	12.326802

The Operation by Gunter's Scale.

One Foot of the Compasses being in the Radius, or S. of 8 Points; extend the other to the Distance 382 Minutes, the said Extent laid from S. Course 3 Points will reach to 212.2 Minutes, the Departure from the Meridian, and the Compasses kept at the same Distance will reach from the S.c. Course 5 Points to 317.6 Minutes, the Difference of Latitude as above.

PROB. II. The Course and Difference of Latitude given, to find the Distance and Departure.

Suppose a Ship sails WSW until the Difference of Latitude be 219 Leagues, and the Distance and Departure required.



The Operation by Logarithms. For the Distance.

As the S.c. of the Course 22d. 30m.	_____	_____	_____	9.582840
To the Difference of Latitude 219 Leagues	_____	_____	_____	2.340444
So is Radius	_____	_____	_____	10.000000
To the Distance, which is 572.2 Leagues	_____	_____	_____	2.757604

For

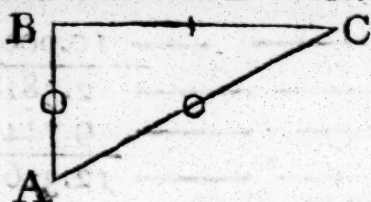
For the Departure.

As Radius	_____	_____	_____	_____	10.000000
To the Distance 572.2 Leagues found before	_____	_____	_____	_____	2.757548
So is the Sine of the Course 67 deg. 30 min.	_____	_____	_____	_____	9.965615
To the Departure 528.6 Leagues	_____	_____	_____	_____	12.723163

By Gunter.

The Compasses being extended from the S. of 2 Points, the Complement of the Course to 219 Leagues, the Difference of Latitude, will reach from Radius S. 8 Points, to 572.2 Leagues, the Distance, and the same Extent of the Compasses from the Sine of the Course 6 Points, will reach to 528.6 Leagues, the Departure.

P R O B. III. The Course and Departure given, to find the Distance and Difference of Latitude.



Suppose a Ship sails North East by East, and her Departure be 220 Minutes, the Distance and Difference of Latitude required.

By Logarithms. For the Distance.

As the S. of the Course 56 deg. 15 min.	_____	_____	_____	9.919846
To the Departure 220 Minutes	_____	_____	_____	2.342423
So is Radius	_____	_____	_____	10.000000
To the Distance 264.6 Minutes	_____	_____	_____	2.422577

For the Difference of Latitude.

As Radius	_____	_____	_____	_____	10.000000
To the Distance 264.6 Minutes	_____	_____	_____	_____	2.422590
So is the S.c. of the Course 33 deg. 45 min.	_____	_____	_____	_____	9.744739
To the Difference of Latitude 147 Minutes	_____	_____	_____	_____	12.167329

By Gunter.

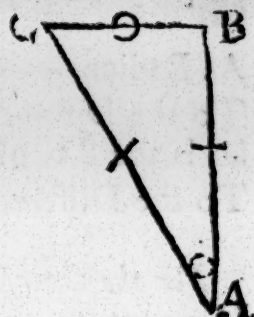
The Extent of the Compasses from the S. of the Course 5 Points, to the Departure 220 Minutes, will reach from Radius S. of 8 Points, to 264.6 the Distance; and the same Extent of the Compasses from S. 3 Points the Complement of the Course, will reach to the Difference of Latitude 147 Minutes, as above.

P R O B. IV. The Distance and Difference of Latitude given, to find the Course and Departure. Sup-

Plane Sailing.

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Suppose a Ship sails between the North and the West 206 Miles, until the Difference of Latitude be 197 Miles, the Course and Departure required.



By Logarithms. For the Course.

As the Distance 206 Miles	_____	_____	_____	2.313867
To the Radius	_____	_____	_____	10.000000
So is the Difference of Latitude 197 Miles	_____	_____	_____	2.294466
To the S.c. of the Course; which is N. 17d. 00m. West.	_____	_____	_____	9.980599

For the Departure.

As the Radius	_____	_____	_____	10.000000
To the Distance 206 Miles	_____	_____	_____	2.313867
So is the S. of the Course 17 deg. 00 min.	_____	_____	_____	9.465935
To the Departure 60.23 Miles	_____	_____	_____	1.779802

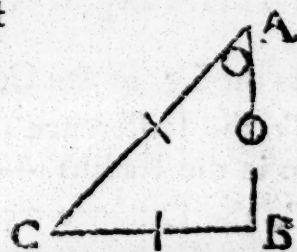
By Gunter.

For the Course. The Extent from the Distance 206 Miles, to the Difference of Latitude 197 Miles, will reach from Radius S. 90 deg. to the Sine of 73 deg. 00 min. the Complement of the Course, which subtracted from 90d. is 17d. 00m. the Course N. Westerly. or N. by W. half W.

For the Departure. The Extent from Radius S. 90d. to the Sine of the Course 17 deg. 00 min. will reach from the Distance 206 Minutes, to the Departure 60.23 Minutes, as above.

P R O B. V. The Distance and Departure given, to find the Course and Difference of Latitude.

Suppose a Ship sails between the South and the West 247 Minutes, until the Departure be 197 Minutes, required the Course and Difference of Latitude.



The Operation by Logarithms. For the Course.

As the Distance 247 Minutes	_____	_____	_____	2.392697
To the Radius	_____	_____	_____	10.000000
So is the Departure 197 Minutes	_____	_____	_____	2.294466
To the Sine of the Course S. 52 deg. 54 min. Westerly	_____	_____	_____	9.901769

For

Plane Sailing.

For the Difference of Latitude.

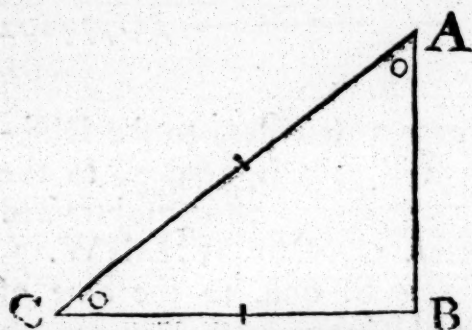
As Radius	10.000000
To the Distance 247 Minutes	2.392697
So is the S.c. of the Course 37 deg. 6 min.	9.780467
To the Difference of Latitude 149 min.	12.173164

By Gunter.

For the Course. The Extent of the Compasses from the Distance 247 Minutes, to the Departure 197 Minutes, will reach the same way from Radius S. 90 deg. to the Sine of the Course 52 deg. 54 min. South West-erly, or South West three quarters West.

For the Difference of Latitude. The Extent from Radius S. 90 deg. to S. 37 deg. 6 min. the Complement of the Course, will reach the same way from the Distance 247 min. to the Difference of Latitude 149 min.

PROB. VI. The Difference of Latitude and Depature given, to find the Course and Distance.



Suppose a Ship sails between the South and the West, until the Difference of Latitude be 154 Leagues, and her Departure 200 Leagues; required the Course and Distance.

The Operation by Logarithms. For the Course.

As the Difference of Latitude 154 Leagues	2.187521
To Radius	10.000000
So is the Departure 200 Leagues	2.301030
To the Tangent of the Course 52d. 24m. South W.erly	10.113509

For the Distance.

As the S.c. of the Course 37 deg. 36 min.	9.785433
To the Difference of Latitude 154 Leagues	2.187521
So is the Radius	10.000000
To the Distance 252.5 Leagues	2.402088

By Gunter.

For the Course. The Extent of the Compasses from the Difference of Latitude 154 Leagues, to the Departure 200 Leagues, will reach from Radius or Tangent of 45 deg. to the Tangent of the Courses, 52 deg. 24 min. South Westerly, or South West three quarters West.

For the Distance. The Extent from the S. 37 deg. 36 min. the Complement of the Course, to Radius, or the Sine of 90 deg. will reach from the Difference of Latitude 154 Leagues, to the Distance 252.5 Leagues.

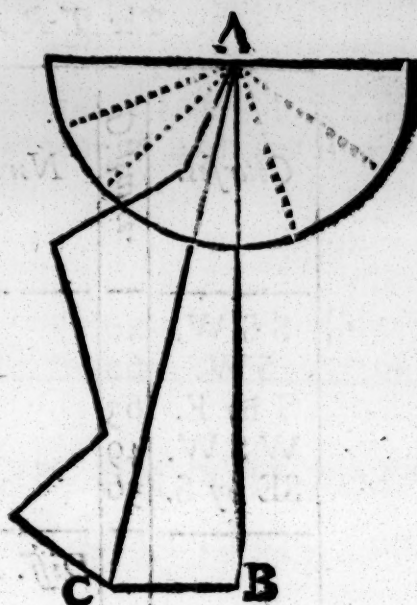
P R O B.

P R O B. VII.

This Problem shews the manner of working a Traverse; and is very useful in keeping a Reckoning by Plane Sailing.

Example.

Suppose a Ship bound to a certain Port, and sails first SSW. 40 minutes, then SW. 60 min. then S. by E. 63 min. then WSW. 49 min. then S. E. by S. 56 min. the Difference of Latitude and Departure the Ship hath made, with the direct Course and Distance is required.



The Operation by Logarithms.

For the Difference of Latitude for the first Course.

As Radius	10.000000
To the Distance 40 min.	1.602060
So is the S.c. of the Course 67d. 30m.	9.965615
To the Difference of Latitude 36.9 min.	11.567675

For the Departure of the first Course.

As Radius	10.000000
To the Distance 40 min.	1.602060
So is the S. of the Course 22d. 30m.	9.582820
To the Departure 15.31 min.	11.184900

By Gunter.

The Extent of the Compasses from Radius the S. of 8 Points, to the Distance 40 min. that Extent in the Compasses laid from the Sine of the Course 2 Points, will reach to 15.3 min. the Departure, and the Compasses being kept to the same Extent, and laid from the S. 6 Points, the Complement of the Course, will reach to 36.9 min. the Difference of Latitude.

In the same manner proceed to find the Difference of Latitude and Departure for each Course and Distance; which being found, place in a Table as follows.

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The TRAVERSE-TABLE.

Courses.	Distance.	North.	South.	East.	West.
SSW.	40		37.0		15.3
SW.	60		42.4		42.4
S by E.	63		61.8	12.3	
WSW.	49		18.8		45.3
SE by S.	56		46.6	31.1	
		Diff. Lat.	206.6	43.4	103.0
				Dep.	43.4
					59.6

The Explanation of the TABLE.

In placing the Difference of Latitude and Departure in their proper Columns, observe, that if the Course be Northerly, the Difference of Latitude is put in the North Column; if it be Southerly, in the South Column; and if the Course be Easterly, the Departure is put in the East Column; if Westerly, in the West Column.

Thus having framed the Table, add up the North, South, East, and West Columns severally, whereby the Difference of Latitude appears to be 206.6 Minutes South, because there is nothing in the North Column; The Departure 59.6 Minutes West, because by so much the West Column exceeds the East; then by this Difference of Latitude and Departure, find the direct Course and Distance as follows.

The Operation by the Logarithms. For the direct Course.

As the Difference of Latitude 206.6 min. ————— 2.315130
 To the Radius ————— 10.000000
 So is the Departure 59.6 min. ————— 1.775246
 To the T. of the Course 16d. 5m. South Westerly, because } 9.460116
 the South and West Columns exceeds the North and East }

For the Distance.

As the S.c. of the Course 16d. 5m. ————— 9.982660
 To the Difference of Latitude 206.6 min. ————— 2.315130
 So is Radius ————— 10.000000
 To the Distance required 215 min. ————— 2.332470
 By

By Gunter. For the direct Course.

The Extent of the Compasses from the Difference of Latitude 206.6m. to the Departure 59.6m. will reach from the Tangent of 45d. (or Radius) to the Tangent of 16d. 5m. the Course required.

For the Distance.

The Extent from S. 73 deg. 55 min. the Complement of the Course, to S. 90 deg. viz. Radius will reach from the Difference of Latitude 206.6m. to the Distance 215 Minutes.

Oblique-angled Plane Triangles, applied in PROBLEMS of Plane - Sailing, and wrought by Logarithms, and Gunter's-Scale.

PROB. I. THE Angles and one of the Sides given, to find either of the other Sides.

Example.

Suppose there are two Ports both under one Meridian, a Ship sails from the Northermost SE. 206 Miles, another Ship sails from the Southermost North East by North, a certain Number of Miles, and meets with the first Ship; the Distance between these two Ports, and the Distance sailed by the second Ship is required.



In the Triangle ADE.

A and E represents the two Ports. AD the first Ship's Distance. ED the second Ship's Distance. AE the Distance between the two Ports.

The Operation by Logarithms. For the Distance between the two Ports.

As S. AED 33d. 45m.	_____	Co. Ar.	0.255261
To AD the first Ship's Distance 206 min.	_____		2.313867
So is S. ADE 101d. 15m. which subtracted from 180d.	_____		9.991574
To AE, the Distance between the two Ports	_____		12.560702

In all Proportions where Radius is not one of the three given Terms, to save the Labour of subtracting the first Logarithm from the Sum of the second and third, use the Complement Arithmetical of the first Logarithm.

L 2

rithm, which is found by subtracting each Figure of the Logarithm from 9, except the first towards the Right-hand, which is subtracted from 10, as in the Operation, the Logarithmic Sine found in the Table is 9.744739, wherefore beginning at the Left-hand, say 9 from 9 there remains 0; 7 from 9 there remains 2; 4 from 9 there remains 5; 4 from 9 there remains 5; 7 from 9 there remains 2; 3 from 9 there remains 6; 9 from 10 there remains 1; So the Complement Arithmetical of the first Logarithm, is 0.255261, which added to the other two Logarithms, and from that Sum abate Radius, the Remainder is the Logarithmic Sine, or Tangent required.

And Note, to find the Sine of any Degree and Minute above 90d. subtract the Degree and Minute from 180d. the Sine of the Remainder (called the Supplement) is the Sine required.

For the Second Ship's Distance.

As S. AED. 33d. 45m. —————	Co. Ar.	0.255261
To AD the first Ship's Distance 206 min. —————		2.313867
So is S. DAE 45d. 00m. —————		9.849485
To DE the second Ship's Distance, 262.2 min. —————		12.418613

By Gunter. For the Distance between the two Ports.

The Extent of the Compasses from S. of 33 deg. 45 min. to the S. ADE 78d. 45m. (*viz.* the Supplement of 101d. 15m. to 180d.) will reach from 206 min. the first Ship's Distance, to 262.2 min. the Distance between the two Ports, as above.

For the second Ship's Distance.

The Extent of the Compasses from the S. of 33d. 45m. to the S. of 45d. 00m. will reach from 206 min. the first Ship's Distance, to 262.2 min. the second Ship's Distance required.

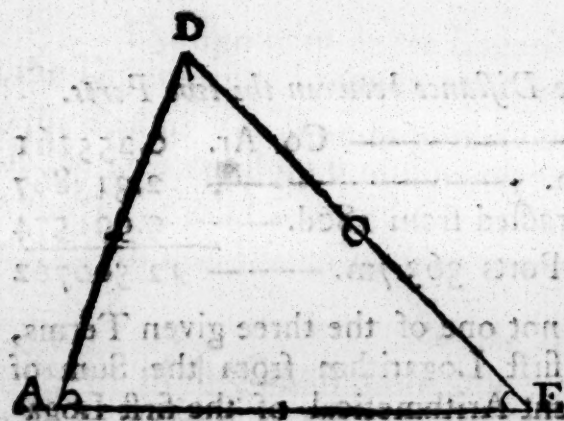
P R O B. II.

Two Sides and an Angle opposite to one of them being given, to find the other opposite Angle and the third Side.

Example.

Suppose two Ports, whose Bearing is North East and South West, distant 396 Miles, a Ship at the northermost sails South South East, and another Ship at the southermost sails thence 518 Miles, and meets with the first Ship; The Course sailed by the second Ship, and the first Ship's Distance are required.

In



Oblique Plane Sailing.

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In the Triangle A D E.

A represents the Southermost Port, D the Northermost.

AD the Distance between the two Ports.

DE the Course and Distance sailed by the first Ship.

AE the Course and Distance sailed by the second Ship.

The Operation by Logarithms. For the second Ship's Course.

As AE the second Ship's Distance 518 min. ————	Co. Ar.	7.285671
To S. ADE 67d. 30m. ————		9.965615
So is AD the Distance between the two Ports 396 min. ————		2.597695
To S. AED 44 deg. 56 min. ————		19.848981

The Angle at D 67d. 30m. and the Angle at E 44d. 56m. being added together and subtracted from 180d. gives 67d. 34m. the Angle at A, which makes nearest 6 Points, and 6 Points reckon'd from the North East to the Southward gives ESE. the second Ship's Course required.

For the first Ship's Distance.

As S. ADE 67d. 30m. ————	Co. Ar.	0.034385
To AE the second Ship's Distance 518m. ————		2.714330
So is S. DAE 67 deg. 34 min. ————		9.965824
To DE the first Ship's Distance 518.3 min. ————		12.714539

By Gunter. For the second Ship's Course.

The Extent of the Compasses from 518 min. to S. 67d. 30m. will reach from 396 min. to S. 44 deg. 56 min. which added to the Angle at D, and the Sum subtracted from 180d. gives 67d. 34m. the Angle at A, as above.

For the first Ship's Distance. The Extent from S. 67d. 30m. to 518m. will reach from S. 67d. 34m. to 518.3 m. the Ship's Distance, as above.

P R O B. III.

Two Sides and the contained Angle given, to find the other Angles and Side.

Example.

Suppose two Ships sail from one Port; one sails NE. 140 Miles, the other South East by East 115 Miles, the Bearing and Distance of these two Ships is required.

Let D represent the Port, DA the first Ship's distance, and DE the second.

Miles
140
115
255
Diff. 25



The Operation by Logarithms. For the Bearing of the two Ships.

As the Sum of the Sides AD and DE 255 min. ——— Co. Ar. 7.593460
 To the Difference of the said Sides 25 min. ——— 1.397940
 So is the T. of half the Sum of their opposite Angles 50d. 37m. 10.085698
 To the T. of half their Difference, which is 6d. 48m. ——— 19.077098

The half Difference added to the half Sum, gives 57d. 25m. the greater Angle AED. The half Difference subtracted from it gives 43d. 49m. the lesser Angle DAE. Wherefore the Bearing of the two Ships is N. Easterly, and South Westerly 1d. 11m.

For the Distance of the two Ships.

As S. AED 57d. 25m. ——— Co. Ar. 0.074374
 To AD the first Ship's Distance 140 min. ——— 2.146128
 So is S. ADE 78d. 45m. ——— 9.991574
 To AE the Distance of the Ships, 163 min. ——— 12.212076

By Gunter. For the Bearing of the two Ships.

The Extent of the Compasses from the Sum of the Sides 255m. to their Difference 25m. will reach from the T. of the Half Sum of the required Angles 50d. 37m. to the T. of half the Diff. of the said Angle 6d. 48m.

In this Proportion by *Gunter*, the Practitioner may be at a Loss, because the Point T. 50d. 37m. would fall beyond the T. of 45d. was the Tangent Line continued: To remedy which, place the Extent from 255 to 25, from the T. 45d. and it will reach to the T. of 5d. 37m. then letting one Point stand at 5d. 37m. extend the other to the T. of 50d. 37m. this Extent place from the T. of 45d. will fall on the T. 6d. 48m. required.

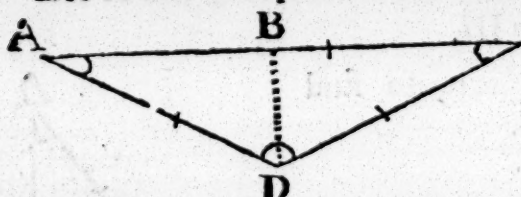
For the Distance of the Ships.

The Extent from the Sine of 57d. 25m. to the Sine of 78d. 45m. will reach from 140m. to 163m.

P R O B. IV. Three Sides being given, to find the Angles.

Example. Suppose there are two Ports both in one Latitude, distant 536 Miles; a Ship sails from the Eastward 306 Miles between the South and the West; another Ship sails from the Westermost 290 Miles, and meets with the first Ship. The Course that each Ship hath steered is required.

Let A and E represent the two Ports, D the Place where the Ships meet.



This Question is resolv'd by letting fall a Perpendicular DB, reducing the Oblique Triangle ADE, into the two Right-angled Triangles ABD and EBD, then the Operation is as follows;

First, find the greater Segment of the Base BE, thus,

As the Base AE, 536 Miles ——— Co. Ar. 7.270835
 To the Sum of the Sides AD and ED 596 Miles ——— 2.775246
 So is the Difference of the said Sides 16 Miles ——— 1.204120
 To the Diff. of the Segments of the Base, which is 17.8 Miles 11.250201

The

Oblique Plane Sailing.

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The whole Base _____ 536 min.
 The Difference of the Segment is _____ 17.8
 Sum is _____ 553.8
 Half Sum _____ 276.9 the greater Segment BE.

Then say, *For the first Ship's Course.*

As DE the first Ship's Distance 306 min. _____ 2.485721
 To Radius _____ 10.000000
 So is the greater Segment BE 276.9 min. _____ 2.442323
 To S.c. BED, 25d. 9m. _____ 9.956602

The Angle at E is the Course from the West Southerly, so the first Ship steers South 64d. 51m. West, or SW. by W. three quarters West almost.

For the second Ship's Course.

As AD the second Ship's Distance 290 min. _____ Co. Ar. 7.537602
 To Sine AED 25d. 9m. _____ 9.628378
 So is DE the first Ship's Distance 306 _____ 2.485721
 To Sine DAE 26d. 39m. _____ 19.651701

The Angle at A is the Course from the East Southerly, so the second Ship steers South 63d. 21m. East, or SE. by E. 3 quarters E. nearly.

By Gunter. For the Difference of the Segments of the Base.

The Extent of the Compasses from the Base AE 536 min. to the Sum of the Sides 596m. will reach from the Difference of the Sides 16, to the Difference of the Segments of the Base 17.8, with which proceed as before.

For the first Ship's Course.

The Extent from the Distance 306 min. to the greater Segment 276.9 min. will reach from Radius or Sine 90d. to Sine 64d. 51m. the Complement BED 25d. 9m. required.

For the second Ship's Course.

The Extent from 290m. the second Ship's Distance, to 306min. the first Ship's Distance, will reach from the Sine 25d. 9m. to the Sine 26d. 39m. the Angle at A required.

P R O B. V.

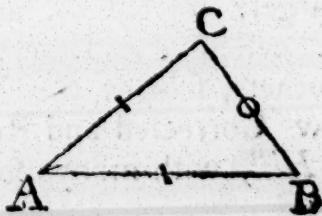
Two Sides and their contained Angle given, to find the third Side.

Example.

Two Ships sails from one Port at A; the first sails East 335 Miles to B, the second sails East 14d. 40m. North, 271 Miles to C; I demand how far they are under, and what is the Course from the Ship at C, to that at B?

In the Triangle ABC,
 there is given.

AB 335
 AC 271
 BAC 14d. 40m. } BC required.



This

This Case requires a double Operation,

1. By the third Case to find the Angles.

2. By the first Case to find the Side required.

AB	335
AC	271
Sum is	606
Diff. is	64

The first Operation.

As the Sum of the Sides AB and AC 606 Miles	Co. Ar.	7.217527
To their Difference 64		1.806180
So is the T. of half Sum of the Angles 82d. 40m.		10.890441
To T. half their Difference 39d. 22m.		19.914148

By which you will find the Angle ABC, to be 43d. 18m.

The second Operation.

As S. ABC 43d. 18m.	Co. Ar.	0.163791
To the Side AC 271 Miles		2.432969
So is S. BAC 14d. 40m.		9.403455
To the Side BC 100 Miles		12.000215

The Angle at B is found to be 43d. 18m. and the Line AB lying East and West, the Course from C to B is East 43d. 18m. South, or South East 1d. 42m. Easterly; and the Distance 100 Miles.

By Gunter. For the Angle at B.

The Extent from 606 Miles the Sum of the Sides, to 64 Miles the Difference of the Sides, will reach from the Tangent of 82d. 40m. half the Sum of the unknown Angles; to the Tangent of 39d. 22m. half their Difference, which being found, proceed according to former Directions, to find the Angle at B.

Then the Extent from S. 43d. 18m. the Angle at B, to S. 14d. 40m. the Angle at A; will reach from 271 Miles the Side AC, to 100 Miles, the Side BC, as above

Thus much for sailing by the *Plane Chart*; which being of some Use in short Voyages, and a good Foundation for further Improvement, we were not willing wholly to omit; but nevertheless would advise all that take Charge of Ships never to content themselves with the Use of the *Plane Chart* only; being so apparently false in itself, and so unsafe for Practice: Nor are we under any Necessity to trust to it, the Defect thereof being now sufficiently supplied by Mr. *Wright's True Chart*, commonly called *Mercator's*, the Projection and Use of which (both in single Questions and Traverses) are largely treated of, and rendered as easy as the *Plane Chart*, in the Book called *Practical Navigation*, (and at this Time treated off by many others, sold at the same Place) first set forth by Mr. *John Seller*, and now Corrected and Reprinted for J. MOUNT, and T. PAGE, on Tower-Hill, with many useful Additions

A large and very useful

TABLE
OF
DIFFERENCE
OF
Latitude and Departure
IN
MINUTES and Tenth Parts,
TO
Every *Degree and Quarter Point*
OF THE
COMPASS,
For the exact Working of a
TRAVERSE.

LONDON, Printed for J. MOUNT and
T. PAGE, on *Tower Hill*.

Diff.	1 Deg.		2 Deg.		$\frac{1}{4}$ Point		3 Deg.		4 Deg.		5 Deg.		Diff.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
1	01.0	00.0	01.0	00.0	01.0	00.0	01.0	00.1	01.0	00.1	01.0	00.1	1
2	02.0	00.1	02.0	00.1	02.0	00.1	02.0	00.1	02.0	00.1	02.0	00.2	2
3	03.0	00.1	03.0	00.1	03.0	00.1	03.0	00.2	03.0	00.2	03.0	00.3	3
4	04.0	00.1	04.0	00.1	04.0	00.2	04.0	00.2	04.0	00.3	04.0	00.3	4
5	05.0	00.1	05.0	00.2	05.0	00.2	05.0	00.3	05.0	00.3	05.0	00.4	5
6	06.0	00.1	06.0	00.2	06.0	00.3	06.0	00.3	06.0	00.4	06.0	00.5	6
7	07.0	00.1	07.0	00.2	07.0	00.3	07.0	00.4	07.0	00.5	07.0	00.6	7
8	08.0	00.1	08.0	00.3	08.0	00.4	08.0	00.4	08.0	00.6	08.0	00.7	8
9	09.0	00.2	09.0	00.3	09.0	00.4	09.0	00.5	09.0	00.6	09.0	00.8	9
10	10.0	00.2	10.0	00.4	10.0	00.5	10.0	00.5	10.0	00.7	10.0	00.9	10
11	11.0	00.2	11.0	00.4	11.0	00.5	11.0	00.6	11.0	00.8	11.0	01.0	11
12	12.0	00.2	12.0	00.4	12.0	00.6	12.0	00.6	12.0	00.8	12.0	01.0	12
13	13.0	00.2	13.0	00.5	13.0	00.6	13.0	00.7	13.0	00.9	12.9	01.1	13
14	14.0	00.2	14.0	00.5	14.0	00.7	14.0	00.7	14.0	01.0	13.9	01.2	14
15	15.0	00.3	15.0	00.5	15.0	00.7	15.0	00.8	15.0	01.0	14.9	01.3	15
16	16.0	00.3	16.0	00.6	16.0	00.8	16.0	00.8	16.0	01.1	15.9	01.4	16
17	17.0	00.3	17.0	00.6	17.0	00.8	17.0	00.9	17.0	01.2	16.9	01.5	17
18	18.0	00.3	18.0	00.6	18.0	00.9	18.0	00.9	18.0	01.3	17.9	01.6	18
19	19.0	00.3	19.0	00.7	19.0	00.9	19.0	01.0	19.0	01.3	18.9	01.7	19
20	20.0	00.4	20.0	00.7	20.0	01.0	20.0	01.0	20.0	01.4	19.9	01.7	20
21	21.0	00.4	21.0	00.7	21.0	01.0	21.0	01.1	20.9	01.5	20.9	01.8	21
22	22.0	00.4	22.0	00.8	22.0	01.1	22.0	01.1	21.9	01.5	21.9	01.9	22
23	23.0	00.4	23.0	00.8	23.0	01.1	23.0	01.2	22.9	01.6	22.9	02.0	23
24	24.0	00.4	24.0	00.8	24.0	01.2	24.0	01.3	23.9	01.7	23.9	02.1	24
25	25.0	00.4	25.0	00.9	25.0	01.2	25.0	01.3	24.9	01.7	24.9	02.2	25
26	26.0	00.5	26.0	00.9	26.0	01.3	26.0	01.4	25.9	01.8	25.9	02.3	26
27	27.0	00.5	27.0	00.9	27.0	01.3	27.0	01.4	26.9	01.9	26.9	02.4	27
28	28.0	00.5	28.0	01.0	28.0	01.4	28.0	01.5	27.9	02.0	27.9	02.4	28
29	29.0	00.5	29.0	01.0	29.0	01.4	29.0	01.5	28.9	02.0	28.9	02.5	29
30	30.0	00.5	30.0	01.1	30.0	01.5	30.0	01.6	29.9	02.1	29.9	02.6	30
31	31.0	00.5	31.0	01.1	31.0	01.5	31.0	01.6	30.9	02.2	30.9	02.7	31
32	32.0	00.6	32.0	01.1	32.0	01.6	32.0	01.7	31.9	02.2	31.9	02.8	32
33	33.0	00.6	33.0	01.2	33.0	01.6	33.0	01.7	32.9	02.3	32.9	02.9	33
34	34.0	00.6	34.0	01.2	34.0	01.7	34.0	01.8	33.9	02.4	33.9	03.0	34
35	35.0	00.6	35.0	01.2	35.0	01.7	35.0	01.8	34.9	02.4	34.9	03.1	35
36	36.0	00.6	36.0	01.3	36.0	01.8	35.9	01.9	35.9	02.5	35.9	03.1	36
37	37.0	00.6	37.0	01.3	37.0	01.8	36.9	01.9	36.9	02.6	36.9	03.2	37
38	38.0	00.7	38.0	01.3	38.0	01.9	37.9	02.0	37.9	02.7	37.9	03.3	38
39	39.0	00.7	39.0	01.4	39.0	01.9	38.9	02.0	38.9	02.7	38.9	03.4	39
40	40.0	00.7	40.0	01.4	40.0	02.0	39.9	02.1	39.9	02.8	39.8	03.5	40
41	41.0	00.7	41.0	01.4	41.0	02.0	40.9	02.1	40.9	02.9	40.8	03.6	41
42	42.0	00.7	42.0	01.5	41.9	02.1	41.9	02.2	41.9	02.9	41.8	03.7	42
43	43.0	00.8	43.0	01.5	42.9	02.1	42.9	02.2	42.9	03.0	42.8	03.8	43
44	44.0	00.8	44.0	01.5	43.9	02.2	43.9	02.3	43.9	03.1	43.8	03.8	44
45	45.0	00.8	45.0	01.6	44.9	02.2	44.9	02.4	44.9	03.1	44.8	03.9	45
46	46.0	00.8	46.0	01.6	45.9	02.3	45.9	02.4	45.9	03.2	45.8	04.0	46
47	47.0	00.8	47.0	01.6	46.9	02.3	46.9	02.5	46.9	03.3	46.8	04.1	47
48	48.0	00.8	48.0	01.7	47.9	02.4	47.9	02.5	47.9	03.4	47.8	04.2	48
49	49.0	00.9	49.0	01.7	48.9	02.4	48.9	02.6	48.9	03.4	48.8	04.3	49
50	50.0	00.9	50.0	01.7	49.9	02.5	49.9	02.6	49.9	03.5	49.8	04.4	50
Diff.	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Diff.
	89 Deg		88 Deg.		$7\frac{1}{4}$ Point		87 Deg		86 Deg.		85 Deg.		

Of LATITUDE and DEPARTURE.

91

Diff	1 Deg.		2 Deg.		1/4 Point		3 Deg.		4 Deg.		5 Deg.		Diff
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
51	51.0	00.9	51.0	01.8	50.9	02.5	50.9	02.7	50.9	03.6	50.8	04.4	51
52	52.0	00.9	52.0	01.8	51.9	02.6	51.9	02.7	51.9	03.6	51.8	04.5	52
53	53.0	00.9	53.0	01.8	52.9	02.6	52.9	02.8	52.9	03.7	52.8	04.6	53
54	54.0	00.9	54.0	01.9	53.9	02.7	53.9	02.8	53.9	03.8	53.8	04.7	54
55	55.0	01.0	55.0	01.9	54.9	02.7	54.9	02.8	54.9	03.8	54.8	04.8	55
56	56.0	01.0	56.0	02.0	55.9	02.7	55.9	02.9	55.9	03.9	55.8	04.9	56
57	57.0	01.0	57.0	02.0	56.9	02.8	56.9	03.0	56.9	04.0	56.8	05.0	57
58	58.0	01.0	58.0	02.0	57.9	02.8	57.9	03.0	57.9	04.0	57.8	05.1	58
59	59.0	01.0	59.0	02.1	58.9	02.9	58.9	03.1	58.9	04.1	58.8	05.1	59
60	60.0	01.0	60.0	02.1	59.9	02.9	59.9	03.1	59.9	04.2	59.8	05.2	60
61	61.0	01.1	61.0	02.1	60.9	03.0	60.9	03.2	60.9	04.3	60.8	05.3	61
62	62.0	01.1	62.0	02.2	61.9	03.0	61.9	03.2	61.9	04.3	61.8	05.4	62
63	63.0	01.1	63.0	02.2	62.9	03.1	62.9	03.3	62.8	04.4	62.8	05.5	63
64	64.0	01.1	64.0	02.2	63.9	03.1	63.9	03.3	63.8	04.5	63.8	05.6	64
65	65.0	01.1	65.0	02.3	64.9	03.2	64.9	03.4	64.8	04.5	64.8	05.7	65
66	66.0	01.2	66.0	02.3	65.9	03.2	65.9	03.5	65.8	04.6	65.7	05.8	66
67	67.0	01.2	67.0	02.3	66.9	03.3	66.9	03.5	66.8	04.7	66.7	05.8	67
68	68.0	01.2	68.0	02.4	67.9	03.3	67.9	03.6	67.8	04.7	67.7	05.9	68
69	69.0	01.2	69.0	02.4	68.9	03.4	68.9	03.6	68.8	04.8	68.7	06.0	69
70	70.0	01.2	70.0	02.4	69.9	03.4	69.9	03.7	69.8	04.9	69.7	06.1	70
71	71.0	01.2	71.0	02.5	70.9	03.5	70.9	03.7	70.8	05.0	70.7	06.2	71
72	72.0	01.3	72.0	02.5	71.9	03.5	71.9	03.8	71.8	05.0	71.7	06.3	72
73	73.0	01.3	73.0	02.5	72.9	03.6	72.9	03.8	72.8	05.1	72.7	06.4	73
74	74.0	01.3	74.0	02.6	73.9	03.6	73.9	03.9	73.8	05.2	73.7	06.5	74
75	75.0	01.3	75.0	02.6	74.9	03.7	74.9	03.9	74.8	05.2	74.7	06.5	75
76	76.0	01.3	76.0	02.7	75.9	03.7	75.9	04.0	75.8	05.3	75.7	06.6	76
77	77.0	01.3	77.0	02.7	76.9	03.8	76.9	04.0	76.8	05.4	76.7	06.7	77
78	78.0	01.4	78.0	02.7	77.9	03.8	77.9	04.1	77.8	05.4	77.7	06.8	78
79	79.0	01.4	79.0	02.8	78.9	03.9	78.9	04.1	78.8	05.5	78.7	06.9	79
80	80.0	01.4	80.0	02.8	79.9	03.9	79.9	04.2	79.8	05.6	79.7	07.0	80
81	81.0	01.4	81.0	02.8	80.9	04.0	80.9	04.2	80.8	05.7	80.7	07.1	81
82	82.0	01.4	81.9	02.9	81.9	04.0	81.9	04.3	81.8	05.7	81.7	07.2	82
83	83.0	01.5	82.9	02.9	82.9	04.1	82.9	04.3	82.8	05.8	82.7	07.2	83
84	84.0	01.5	83.9	02.9	83.9	04.1	83.9	04.4	83.8	05.9	83.7	07.3	84
85	85.0	01.5	84.9	03.0	84.9	04.2	84.9	04.4	84.8	05.9	84.7	07.4	85
86	86.0	01.5	85.9	03.0	85.9	04.2	85.9	04.5	85.8	06.0	85.7	07.5	86
87	87.0	01.5	86.9	03.0	86.9	04.3	86.9	04.6	86.8	06.1	86.7	07.6	87
88	88.0	01.5	87.9	03.1	87.9	04.3	87.9	04.6	87.8	06.1	87.7	07.7	88
89	89.0	01.6	88.9	05.1	88.9	04.4	88.9	04.7	88.8	06.2	88.7	07.8	89
90	90.0	01.6	89.9	03.1	89.9	04.4	89.9	04.7	89.8	06.3	89.7	07.8	90
91	91.0	01.6	90.9	03.2	90.9	04.5	90.9	04.8	90.8	06.4	90.7	07.9	91
92	92.0	01.6	91.9	03.2	91.9	04.5	91.9	04.8	91.8	06.4	91.6	08.0	92
93	93.0	01.6	92.9	03.2	92.9	04.6	92.9	04.9	92.8	06.5	92.6	08.1	93
94	94.0	01.6	93.9	03.3	93.9	04.6	93.9	04.9	93.8	06.6	93.6	08.2	94
95	95.0	01.7	94.9	03.3	94.9	04.7	94.9	05.0	94.8	06.6	94.6	08.3	95
96	96.0	01.7	95.9	03.4	95.9	04.7	95.9	05.0	95.8	06.7	95.6	08.4	96
97	97.0	01.7	96.9	03.4	96.9	04.8	96.9	05.1	96.8	06.8	96.6	08.5	97
98	98.0	01.7	97.9	03.4	97.9	04.8	97.9	05.1	97.8	06.8	97.6	08.5	98
99	99.0	01.7	98.9	03.5	98.9	04.9	98.9	05.2	98.8	06.9	98.6	08.6	99
100	100.0	01.7	99.9	03.5	99.9	04.9	99.9	05.2	99.8	07.0	99.6	08.7	100
Diff	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Diff
	89 Deg		88 Deg		7 1/2 Point		87 Deg		86 Deg		85 Deg		

A Table of DIFFERENCE

Diff	$\frac{1}{2}$ Point		6 Deg.		7 Deg.		8 Deg.		$\frac{1}{4}$ Point		9 Deg.		Diff
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
1	01.0	00.1	01.0	00.1	01.0	00.1	01.0	00.1	01.0	00.1	01.0	00.2	1
2	02.0	00.2	02.0	00.2	02.0	00.2	02.0	00.3	02.0	00.3	02.0	00.3	2
3	03.0	00.3	03.0	00.3	03.0	00.4	03.0	00.4	03.0	00.4	03.0	00.5	3
4	04.0	00.4	04.0	00.4	04.0	00.5	04.0	00.6	04.0	00.6	03.9	00.6	4
5	05.0	00.5	05.0	00.5	05.0	00.6	05.0	00.7	04.9	00.7	04.9	00.8	5
6	06.0	00.6	06.0	00.6	06.0	00.7	05.9	00.8	05.9	00.9	05.9	00.9	6
7	07.0	00.7	07.0	00.7	06.9	00.9	06.9	01.0	06.9	01.0	06.9	01.1	7
8	08.0	00.8	08.0	00.8	07.9	01.0	07.9	01.1	07.9	01.2	07.9	01.3	8
9	09.0	00.9	08.9	00.9	08.9	01.1	08.9	01.2	08.9	01.3	08.9	01.4	9
10	10.0	01.0	09.9	01.0	09.9	01.2	09.9	01.4	09.9	01.5	09.9	01.6	10
11	10.9	01.1	10.9	01.1	10.9	01.3	10.9	01.5	10.9	01.6	10.9	01.7	11
12	11.9	01.2	11.9	01.3	11.9	01.5	11.9	01.7	11.9	01.8	11.9	01.9	12
13	12.9	01.3	12.9	01.4	12.9	01.6	12.9	01.8	12.9	01.9	12.8	02.0	13
14	13.9	01.4	13.9	01.5	13.9	01.7	13.9	01.9	13.8	02.1	13.8	02.2	14
15	14.9	01.5	14.9	01.6	14.9	01.8	14.9	02.1	14.8	02.2	14.8	02.3	15
16	15.9	01.6	15.9	01.7	15.9	01.9	15.8	02.2	15.8	02.3	15.8	02.5	16
17	16.9	01.7	16.9	01.8	16.9	02.1	16.8	02.4	16.8	02.5	16.8	02.7	17
18	17.9	01.8	17.9	01.9	17.9	02.2	17.8	02.5	17.8	02.6	17.8	02.8	18
19	18.9	01.9	18.9	02.0	18.9	02.3	18.8	02.6	18.8	02.8	18.8	03.0	19
20	19.9	02.0	19.9	02.1	19.8	02.4	19.8	02.8	19.8	02.9	19.8	03.1	20
21	20.9	02.1	20.9	02.2	20.8	02.6	20.8	02.9	20.8	03.1	20.7	03.3	21
22	21.9	02.2	21.9	02.3	21.8	02.7	21.8	03.1	21.8	03.2	21.7	03.4	22
23	22.9	02.3	22.9	02.4	22.8	02.8	22.8	03.2	22.8	03.4	22.7	03.6	23
24	23.9	02.4	23.9	02.5	23.8	02.9	23.8	03.3	23.7	03.5	23.7	03.8	24
25	24.9	02.4	24.9	02.6	24.8	03.0	24.8	03.5	24.7	03.7	24.7	03.9	25
26	25.9	02.5	25.9	02.7	25.8	03.2	25.7	03.6	25.7	03.8	25.7	04.1	26
27	26.9	02.6	26.9	02.8	26.8	03.3	26.7	03.8	26.7	04.0	26.7	04.2	27
28	27.9	02.7	27.8	02.9	27.8	03.4	27.7	03.9	27.7	04.1	27.7	04.4	28
29	28.9	02.8	28.8	03.0	28.8	03.5	28.7	04.0	28.7	04.3	28.6	04.5	29
30	29.9	02.9	29.8	03.1	29.8	03.7	29.7	04.2	29.7	04.4	29.6	04.7	30
31	30.8	03.0	30.8	03.2	30.8	03.8	30.7	04.3	30.7	04.5	30.6	04.9	31
32	31.8	03.1	31.8	03.3	31.8	03.9	31.7	04.5	31.7	04.7	31.6	05.1	32
33	32.8	03.2	32.8	03.4	32.8	04.0	32.7	04.6	32.6	04.8	32.6	05.2	33
34	33.8	03.3	33.8	03.6	33.7	04.1	33.7	04.7	33.6	05.0	33.6	05.4	34
35	34.8	03.4	34.8	03.7	34.7	04.3	34.7	04.9	34.6	05.1	34.6	05.5	35
36	35.8	03.5	35.8	03.8	35.7	04.4	35.6	05.0	35.6	05.3	35.6	05.6	36
37	36.8	03.6	36.8	03.9	36.7	04.5	36.6	05.1	36.6	05.4	36.5	05.8	37
38	37.8	03.7	37.8	04.0	37.7	04.6	37.6	05.3	37.6	05.6	37.5	05.9	38
39	38.8	03.8	38.8	04.1	38.7	04.8	38.6	05.4	38.6	05.7	38.5	06.1	39
40	39.8	03.9	39.8	04.2	39.7	04.9	39.6	05.6	39.6	05.9	39.5	06.3	40
41	40.8	04.0	40.8	04.3	40.7	05.0	40.6	05.7	40.6	06.0	40.5	06.4	41
42	41.8	04.1	41.8	04.4	41.7	05.1	41.6	05.8	41.5	06.2	41.5	06.6	42
43	42.8	04.2	42.8	04.5	42.7	05.2	42.6	06.0	42.5	06.3	42.5	06.7	43
44	43.8	04.3	43.8	04.6	43.7	05.4	43.6	06.1	43.5	06.5	43.5	06.9	44
45	44.8	04.4	44.8	04.7	44.7	05.5	44.6	06.3	44.5	06.6	44.4	07.0	45
46	45.8	04.5	45.7	04.8	45.7	05.6	45.6	06.4	45.5	06.7	45.4	07.2	46
47	46.8	04.6	46.7	04.9	46.6	05.7	46.5	06.6	46.5	06.9	46.4	07.3	47
48	47.8	04.7	47.7	05.0	47.6	05.9	47.5	06.7	47.5	07.0	47.4	07.5	48
49	48.8	04.8	48.7	05.1	48.6	06.0	48.5	06.8	48.5	07.2	48.4	07.7	49
50	49.8	04.9	49.7	05.2	49.6	06.1	49.5	07.0	49.5	07.3	49.4	07.8	50
Diff	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Diff
	$7\frac{1}{2}$ Points		84 Deg.		83 Deg.		82 Deg.		$7\frac{1}{2}$ Point		81 Deg.		

Of LATITUDE and DEPARTURE.

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Diff	$\frac{1}{4}$ Point		6 Deg.		7 Deg.		8 Deg.		$\frac{1}{4}$ Point		9 Deg.		Diff
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
51	50.8	05.0	50.7	05.3	50.6	06.2	50.5	07.1	50.4	07.5	50.4	08.0	51
52	51.7	05.1	51.7	05.4	51.6	06.3	51.5	07.2	51.4	07.6	51.4	08.1	52
53	52.7	05.2	52.7	05.5	52.6	06.5	52.5	07.4	52.4	07.8	52.3	08.3	53
54	53.7	05.3	53.7	05.6	53.6	06.6	53.5	07.5	53.4	07.9	53.3	08.4	54
55	54.7	05.4	54.7	05.7	54.6	06.7	54.5	07.7	54.4	08.1	54.3	08.6	55
56	55.7	05.5	55.7	05.9	55.6	06.8	55.5	07.8	55.4	08.2	55.3	08.8	56
57	56.7	05.6	56.7	06.0	56.6	06.9	56.4	07.9	56.4	08.4	56.3	08.9	57
58	57.7	05.7	57.7	06.1	57.6	07.1	57.4	08.1	57.4	08.5	57.3	09.1	58
59	58.7	05.8	58.7	06.2	58.6	07.2	58.4	08.2	58.4	08.7	58.3	09.2	59
60	59.7	05.9	59.7	06.3	59.5	07.3	59.4	08.4	59.4	08.8	59.3	09.4	60
61	60.7	06.0	60.7	06.4	60.5	07.4	60.4	08.5	60.3	08.9	60.2	09.5	61
62	61.7	06.1	61.7	06.5	61.5	07.6	61.4	08.6	61.3	09.1	61.2	09.7	62
63	62.7	06.2	62.7	06.6	62.5	07.7	62.4	08.8	62.3	09.2	62.2	09.9	63
64	63.7	06.3	63.6	06.7	63.5	07.8	63.4	08.9	63.3	09.4	63.2	10.0	64
65	64.7	06.4	64.6	06.8	64.5	07.9	64.4	09.0	64.3	09.5	64.2	10.2	65
66	65.7	06.5	65.6	06.9	65.5	08.0	65.4	09.2	65.3	09.7	65.2	10.3	66
67	66.7	06.6	66.6	07.0	66.5	08.2	66.3	09.3	66.3	09.8	66.2	10.5	67
68	67.7	06.7	67.6	07.1	67.5	08.3	67.3	09.5	67.3	10.0	67.2	10.6	68
69	68.7	06.8	68.6	07.2	68.5	08.4	68.3	09.6	68.3	10.1	68.2	10.8	69
70	69.7	06.9	69.6	07.3	69.5	08.5	69.3	09.7	69.2	10.3	69.1	10.9	70
71	70.7	07.0	70.6	07.4	70.5	08.7	70.3	09.9	70.2	10.4	70.1	11.1	71
72	71.7	07.1	71.6	07.5	71.5	08.8	71.3	10.0	71.2	10.6	71.1	11.3	72
73	72.6	07.2	72.6	07.6	72.5	08.9	72.3	10.2	72.2	10.7	72.1	11.4	73
74	73.6	07.3	73.6	07.7	73.4	09.0	73.3	10.3	73.2	10.9	73.1	11.6	74
75	74.6	07.3	74.6	07.8	74.4	09.1	74.3	10.4	74.2	11.0	74.1	11.7	75
76	75.6	07.4	75.6	07.9	75.4	09.3	75.3	10.6	75.2	11.1	75.1	11.9	76
77	76.6	07.5	76.6	08.0	76.4	09.4	76.3	10.7	76.2	11.3	76.1	12.0	77
78	77.6	07.6	77.6	08.1	77.4	09.5	77.2	10.9	77.2	11.4	77.0	12.2	78
79	78.6	07.7	78.6	08.3	78.4	09.6	78.2	11.0	78.1	11.6	78.0	12.4	79
80	79.6	07.8	79.6	08.4	79.4	09.8	79.2	11.1	79.1	11.7	79.0	12.5	80
81	80.6	07.9	80.6	08.5	80.4	09.9	80.2	11.3	80.1	11.9	80.0	12.7	81
82	81.6	08.0	81.5	08.6	81.4	10.0	81.2	11.4	81.1	12.0	81.0	12.8	82
83	82.6	08.1	82.5	08.7	82.4	10.1	82.2	11.6	82.1	12.2	82.0	13.0	83
84	83.6	08.2	83.5	08.8	83.4	10.2	83.2	11.7	83.1	12.3	83.0	13.1	84
85	84.6	08.3	84.5	08.9	84.4	10.4	84.2	11.8	84.1	12.5	84.0	13.3	85
86	85.6	08.4	85.5	09.0	85.4	10.5	85.2	12.0	85.1	12.6	84.9	13.4	86
87	86.6	08.5	86.5	09.1	86.3	10.6	86.2	12.1	86.0	12.8	85.9	13.6	87
88	87.6	08.6	87.5	09.2	87.3	10.7	87.1	12.2	87.0	12.9	86.9	13.8	88
89	88.6	08.7	88.5	09.3	88.3	10.8	88.1	12.4	88.0	13.1	87.9	13.9	89
90	89.6	08.8	89.5	09.4	89.3	11.0	89.1	12.5	89.0	13.2	88.9	14.1	90
91	90.6	08.9	90.5	09.5	90.3	11.1	90.1	12.7	90.0	13.3	89.9	14.2	91
92	91.6	09.0	91.5	09.6	91.3	11.2	91.1	12.8	91.0	13.5	90.9	14.4	92
93	92.6	09.1	92.5	09.7	92.3	11.3	92.1	12.9	92.0	13.6	91.9	14.5	93
94	93.5	09.2	93.5	09.8	93.3	11.5	93.1	13.1	93.0	13.8	92.8	14.7	94
95	94.5	09.3	94.5	09.9	94.3	11.6	94.1	13.2	94.0	13.9	93.8	14.9	95
96	95.5	09.4	95.5	10.0	95.3	11.7	95.1	13.4	95.0	14.1	94.8	15.0	96
97	96.5	09.5	96.5	10.1	96.3	11.8	96.1	13.5	96.0	14.2	95.8	15.2	97
98	97.5	09.6	97.5	10.2	97.3	11.9	97.0	13.6	96.9	14.4	96.8	15.3	98
99	98.5	09.7	98.5	10.3	98.3	12.1	98.0	13.8	97.9	14.5	97.8	15.5	99
100	99.5	09.8	99.4	10.4	99.2	12.2	99.0	13.9	98.9	14.7	98.8	15.6	100
Diff	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Diff
	$7\frac{1}{4}$ Point		84 Deg.		83 Deg.		82 Deg.		$7\frac{1}{4}$ Point		81 Deg.		

Diff	10 Deg.		11 Deg.		1 Point		12 Deg.		13 Deg.		14 Deg.		Diff
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
1	01.0	00.2	01.0	00.2	01.0	00.2	01.0	00.2	01.0	00.2	01.0	00.2	1
2	02.0	00.3	02.0	00.4	02.0	00.4	02.0	00.4	01.9	00.4	01.9	00.5	2
3	03.0	00.5	02.9	00.6	02.9	00.6	02.9	00.6	02.9	00.7	02.9	00.7	3
4	03.9	00.7	03.9	00.8	03.9	00.8	03.9	00.8	03.9	00.9	03.9	01.0	4
5	04.9	00.9	04.9	01.0	04.9	01.0	04.9	01.0	04.9	01.1	04.9	01.2	5
6	05.9	01.0	05.9	01.1	05.9	01.2	05.9	01.2	05.8	01.3	05.8	01.4	6
7	06.9	01.2	06.9	01.3	06.9	01.4	06.8	01.5	06.8	01.6	06.8	01.7	7
8	07.9	01.4	07.9	01.5	07.8	01.6	07.8	01.7	07.8	01.8	07.8	01.9	8
9	08.9	01.6	08.8	01.7	08.8	01.8	08.8	01.9	08.8	02.0	08.7	02.2	9
10	09.8	01.7	09.8	01.9	09.8	02.0	09.8	02.1	09.7	02.2	09.7	02.4	10
11	10.8	01.9	10.8	02.1	10.8	02.1	10.8	02.3	10.7	02.5	10.7	02.7	11
12	11.8	02.1	11.8	02.3	11.8	02.3	11.7	02.5	11.7	02.7	11.6	02.9	12
13	12.8	02.3	12.8	02.5	12.7	02.5	12.7	02.7	12.7	02.9	12.6	03.1	13
14	13.8	02.4	13.7	02.7	13.7	02.7	13.7	02.9	13.6	03.1	13.6	03.4	14
15	14.8	02.6	14.7	02.9	14.7	02.9	14.7	03.1	14.6	03.4	14.6	03.6	15
16	15.8	02.8	15.7	03.1	15.7	03.1	15.6	03.3	15.6	03.6	15.5	03.9	16
17	16.7	03.0	16.7	03.2	16.7	03.3	16.6	03.5	16.6	03.8	16.5	04.1	17
18	17.7	03.1	17.7	03.4	17.7	03.5	17.6	03.7	17.5	04.0	17.5	04.4	18
19	18.7	03.3	18.6	03.6	18.6	03.7	18.6	03.9	18.5	04.3	18.4	04.6	19
20	19.7	03.5	19.6	03.8	19.6	03.9	19.6	04.2	19.5	04.5	19.4	04.8	20
21	20.7	03.6	20.6	04.0	20.6	04.1	20.5	04.4	20.5	04.7	20.4	05.1	21
22	21.7	03.8	21.6	04.2	21.6	04.3	21.5	04.6	21.4	04.9	21.3	05.3	22
23	22.6	04.0	22.6	04.4	22.6	04.5	22.5	04.8	22.4	05.2	22.3	05.6	23
24	23.6	04.2	23.6	04.6	23.5	04.7	23.5	05.0	23.4	05.4	23.3	05.8	24
25	24.6	04.3	24.5	04.8	24.5	04.9	24.5	05.2	24.4	05.6	24.3	06.0	25
26	25.6	04.5	25.5	05.0	25.5	05.1	25.4	05.4	25.3	05.8	25.2	06.3	26
27	26.6	04.7	26.5	05.2	26.5	05.3	26.4	05.6	26.3	06.1	26.2	06.5	27
28	27.6	04.9	27.5	05.3	27.5	05.5	27.4	05.8	27.3	06.3	27.2	06.8	28
29	28.6	05.0	28.5	05.5	28.4	05.7	28.4	06.0	28.3	06.5	28.1	07.0	29
30	29.5	05.2	29.4	05.7	29.4	05.9	29.3	06.2	29.2	06.7	29.1	07.3	30
31	30.5	05.4	30.4	05.9	30.4	06.0	30.3	06.4	30.2	07.0	30.1	07.5	31
32	31.5	05.6	31.4	06.1	31.4	06.2	31.3	06.7	31.2	07.2	31.0	07.7	32
33	32.5	05.7	32.4	06.3	32.4	06.4	32.3	06.9	32.2	07.4	32.0	08.0	33
34	33.5	05.9	33.4	06.5	33.3	06.6	33.3	07.1	33.1	07.6	33.0	08.2	34
35	34.5	06.1	34.4	06.7	34.3	06.8	34.2	07.3	34.1	07.9	34.0	08.5	35
36	35.4	06.2	35.3	06.9	35.3	07.0	35.2	07.5	35.1	08.1	34.9	08.7	36
37	36.4	06.4	36.3	07.1	36.3	07.2	36.2	07.7	36.1	08.3	35.9	09.0	37
38	37.4	06.6	37.3	07.2	37.3	07.4	37.2	07.9	37.0	08.5	36.9	09.2	38
39	38.4	06.8	38.3	07.4	38.3	07.6	38.1	08.1	38.0	08.8	37.8	09.4	39
40	39.4	06.9	39.3	07.6	39.2	07.8	39.1	08.3	39.0	09.0	38.8	09.7	40
41	40.4	07.1	40.2	07.8	40.2	08.0	40.1	08.5	39.9	09.2	39.8	09.9	41
42	41.4	07.3	41.2	08.0	41.2	08.2	41.1	08.7	40.9	09.4	40.8	10.2	42
43	42.3	07.5	42.2	08.2	42.2	08.4	42.1	08.9	41.9	09.7	41.7	10.4	43
44	43.3	07.6	43.2	08.4	43.2	08.6	43.0	09.1	42.9	09.9	42.7	10.6	44
45	44.3	07.8	44.2	08.6	44.1	08.8	44.0	09.4	43.8	10.1	43.7	10.9	45
46	45.3	08.0	45.2	08.8	45.1	09.0	45.0	09.6	44.8	10.3	44.6	11.1	46
47	46.3	08.2	46.1	09.0	46.1	09.2	46.0	09.8	45.8	10.6	45.6	11.4	47
48	47.3	08.3	47.1	09.2	47.1	09.4	47.0	10.0	46.8	10.8	46.6	11.6	48
49	48.3	08.5	48.1	09.3	48.1	09.6	47.9	10.2	47.7	11.0	47.5	11.9	49
50	49.2	08.7	49.1	09.5	49.0	09.8	48.9	10.4	48.7	11.2	48.5	12.1	50
Diff	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Diff
	80 Deg.		79 Deg.		7 Points		78 Deg.		77 Deg.		76 Deg.		

Of LATITUDE and DEPARTURE.

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Diff.	10 Deg.		11 Deg.		1 Point		12 Deg.		13 Deg.		14 Deg.		Diff.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
51	50.2	08.9	50.1	09.7	50.0	10.0	49.9	10.6	49.7	11.5	49.5	12.3	51
52	51.2	09.0	51.0	09.9	51.0	10.1	50.9	10.8	50.7	11.7	50.5	12.6	52
53	52.2	09.2	52.0	10.1	52.0	10.3	51.8	11.0	51.0	11.9	51.4	12.8	53
54	53.2	09.4	53.0	10.3	53.0	10.5	52.8	11.2	52.6	12.1	52.4	13.1	54
55	54.2	09.5	54.0	10.5	53.9	10.7	53.8	11.4	53.6	12.4	53.4	13.3	55
56	55.1	09.7	55.0	10.7	54.9	10.9	54.8	11.6	54.6	12.6	54.3	13.5	56
57	56.1	09.9	56.0	10.9	55.9	11.1	55.8	11.8	55.5	12.8	55.3	13.8	57
58	57.1	10.1	56.9	11.1	56.9	11.3	56.7	12.1	56.5	13.0	56.3	14.0	58
59	58.1	10.2	57.9	11.3	57.9	11.5	57.7	12.3	57.5	13.3	57.2	14.3	59
60	59.1	10.4	58.9	11.4	58.8	11.7	58.7	12.5	58.5	13.5	58.2	14.5	60
61	60.1	10.6	59.9	11.6	59.8	11.9	59.7	12.7	59.4	13.7	59.2	14.8	61
62	61.1	10.8	60.9	11.8	60.8	12.1	60.6	12.9	60.4	13.9	60.2	15.0	62
63	62.0	10.9	61.8	12.0	61.8	12.3	61.6	13.1	61.4	14.2	61.1	15.2	63
64	63.0	11.1	62.8	12.2	62.8	12.5	62.6	13.3	62.4	14.4	62.1	15.5	64
65	64.0	11.3	63.8	12.4	63.8	12.7	63.6	13.5	63.3	14.6	63.1	15.7	65
66	65.0	11.5	64.8	12.6	64.7	12.9	64.6	13.7	64.3	14.8	64.0	16.0	66
67	66.0	11.6	65.8	12.8	65.7	13.1	65.5	13.9	65.3	15.1	65.0	16.2	67
68	67.0	11.8	66.7	13.0	66.7	13.3	66.5	14.1	66.3	15.3	66.0	16.4	68
69	68.0	12.0	67.7	13.2	67.7	13.5	67.5	14.3	67.2	15.5	66.9	16.7	69
70	68.9	12.2	68.7	13.4	68.7	13.7	68.5	14.6	68.2	15.7	67.9	16.9	70
71	69.9	12.3	69.7	13.5	69.6	13.9	69.4	14.8	69.2	16.0	68.9	17.2	71
72	70.9	12.5	70.7	13.7	70.6	14.0	70.4	15.0	70.2	16.2	69.9	17.4	72
73	71.9	12.7	71.7	13.9	71.6	14.2	71.4	15.2	71.1	16.4	70.8	17.7	73
74	72.9	12.8	72.6	14.1	72.6	14.4	72.4	15.4	72.1	16.6	71.8	17.9	74
75	73.9	13.0	73.6	14.3	73.6	14.6	73.4	15.6	73.1	16.9	72.8	18.1	75
76	74.8	13.2	74.6	14.5	74.5	14.8	74.3	15.8	74.1	17.1	73.7	18.4	76
77	75.8	13.4	75.6	14.7	75.5	15.0	75.3	16.0	75.0	17.3	74.7	18.6	77
78	76.8	13.5	76.6	14.9	76.5	15.2	76.3	16.2	76.0	17.5	75.7	18.9	78
79	77.8	13.7	77.5	15.1	77.5	15.4	77.3	16.4	77.0	17.8	76.7	19.1	79
80	78.8	13.9	78.5	15.3	78.5	15.6	78.2	16.6	78.0	18.0	77.6	19.4	80
81	79.8	14.1	79.5	15.5	79.4	15.8	79.2	16.8	78.9	18.2	78.6	19.6	81
82	80.8	14.2	80.5	15.6	80.4	16.0	80.2	17.0	79.9	18.4	79.6	19.8	82
83	81.7	14.4	81.5	15.8	81.4	16.2	81.2	17.3	80.9	18.7	80.5	20.1	83
84	82.7	14.6	82.5	16.0	82.4	16.4	82.2	17.5	81.8	18.9	81.5	20.3	84
85	83.7	14.8	83.4	16.2	83.4	16.6	83.1	17.7	82.8	19.1	82.5	20.6	85
86	84.7	14.9	84.4	16.4	84.3	16.8	84.1	17.9	83.8	19.3	83.4	20.8	86
87	85.7	15.1	85.4	16.6	85.3	17.0	85.1	18.1	84.8	19.6	84.4	21.0	87
88	86.7	15.3	86.4	16.8	86.3	17.2	86.1	18.3	85.7	19.8	85.4	21.3	88
89	87.6	15.4	87.4	17.0	87.3	17.4	87.1	18.5	86.7	20.0	86.4	21.5	89
90	88.6	15.6	88.3	17.2	88.3	17.6	88.0	18.7	87.7	20.2	87.3	21.8	90
91	89.6	15.8	89.3	17.4	89.3	17.8	89.0	18.9	88.7	20.5	88.3	22.0	91
92	90.6	16.0	90.3	17.6	90.2	17.9	90.0	19.1	89.6	20.7	89.3	22.3	92
93	91.6	16.1	91.3	17.7	91.2	18.1	91.0	19.3	90.6	20.9	90.2	22.5	93
94	92.6	16.3	92.3	17.9	92.2	18.3	91.9	19.5	91.6	21.1	91.2	22.7	94
95	93.6	16.5	93.3	18.1	93.2	18.5	92.9	19.7	92.6	21.4	92.2	23.0	95
96	94.5	16.7	94.2	18.3	94.2	18.7	93.9	20.0	93.5	21.6	93.1	23.2	96
97	95.5	16.8	95.2	18.5	95.1	18.9	94.9	20.2	94.5	21.8	94.1	23.5	97
98	96.5	17.0	96.2	18.7	96.1	19.1	95.9	20.4	95.5	22.0	95.1	23.7	98
99	97.5	17.2	97.2	18.9	97.1	19.3	96.8	20.6	96.5	22.2	96.1	23.9	99
100	98.5	17.4	98.2	19.1	98.1	19.5	97.8	20.8	97.4	22.6	97.0	24.2	100
Diff.	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Diff.
	80 Deg.		79 Deg.		7 Points		78 Deg.		77 Deg.		76 Deg.		

Diff	1 $\frac{1}{4}$ Point		15 Deg.		16 Deg.		1 $\frac{1}{2}$ Point		17 Deg.		18 Deg.		Diff
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
1	01.0	00.2	01.0	00.3	01.0	00.3	01.0	00.3	01.0	00.3	01.0	00.3	1
2	01.9	00.5	01.9	00.5	01.9	00.6	01.9	00.6	01.9	00.6	01.9	00.6	2
3	02.9	00.7	02.9	00.8	02.9	00.8	02.9	00.9	02.9	00.9	02.9	00.9	3
4	03.9	01.0	03.9	01.0	03.8	01.1	03.8	01.2	03.8	01.2	03.8	01.2	4
5	04.8	01.2	04.8	01.3	04.8	01.4	04.8	01.5	04.8	01.5	04.8	01.5	5
6	05.8	01.5	05.8	01.5	05.8	01.7	05.7	01.7	05.7	01.8	05.7	01.9	6
7	06.8	01.7	06.8	01.8	06.7	01.9	06.7	02.0	06.7	02.0	06.7	02.2	7
8	07.8	01.9	07.7	02.1	07.7	02.2	07.7	02.3	07.6	02.3	07.6	02.5	8
9	08.7	02.2	08.7	02.3	08.7	02.5	08.6	02.6	08.6	02.6	08.6	02.8	9
10	09.7	02.4	09.7	02.6	09.6	02.8	09.6	02.9	09.6	02.9	09.5	03.1	10
11	10.7	02.7	10.6	02.8	10.6	03.0	10.5	03.2	10.5	03.2	10.5	03.4	11
12	11.6	02.9	11.6	03.1	11.5	03.3	11.5	03.5	11.5	03.5	11.4	03.7	12
13	12.6	03.2	12.6	03.4	12.5	03.6	12.4	03.8	12.4	03.8	12.4	04.0	13
14	13.6	03.4	13.5	03.6	13.5	03.9	13.4	04.1	13.4	04.1	13.3	04.3	14
15	14.5	03.6	14.5	03.9	14.4	04.1	14.4	04.4	14.3	04.4	14.3	04.6	15
16	15.5	03.9	15.5	04.1	15.4	04.4	15.3	04.6	15.3	04.7	15.2	04.9	16
17	16.5	04.1	16.4	04.4	16.3	04.7	16.3	04.9	16.3	05.0	16.2	05.3	17
18	17.5	04.4	17.4	04.7	17.3	05.0	17.2	05.2	17.2	05.3	17.1	05.6	18
19	18.4	04.6	18.4	04.9	18.3	05.2	18.2	05.5	18.2	05.6	18.1	05.9	19
20	19.4	04.9	19.3	05.2	19.2	05.5	19.1	05.8	19.1	05.8	19.0	06.2	20
21	20.4	05.1	20.3	05.4	20.2	05.8	20.1	06.1	20.1	06.1	20.0	06.5	21
22	21.3	05.3	21.2	05.7	21.1	06.1	21.1	06.4	21.0	06.4	20.9	06.8	22
23	22.3	05.6	22.2	06.0	22.1	06.3	22.0	06.7	22.0	06.7	21.9	07.1	23
24	23.3	05.8	23.2	06.2	23.1	06.6	23.0	07.0	22.9	07.0	22.8	07.4	24
25	24.2	06.1	24.1	06.5	24.0	06.9	23.9	07.3	23.9	07.3	23.8	07.7	25
26	25.2	06.3	25.1	06.7	25.0	07.2	24.9	07.5	24.9	07.6	24.7	08.0	26
27	26.2	06.6	26.1	07.0	26.0	07.4	25.8	07.8	25.8	07.9	25.7	08.3	27
28	27.2	06.8	27.0	07.2	26.9	07.7	26.8	08.1	26.8	08.2	26.6	08.7	28
29	28.1	07.0	28.0	07.5	27.9	08.0	27.8	08.4	27.7	08.5	27.6	09.0	29
30	29.1	07.3	29.0	07.8	28.8	08.3	28.7	08.7	28.7	08.8	28.5	09.3	30
31	30.1	07.5	29.9	08.0	29.8	08.5	29.7	09.0	29.6	09.1	29.5	09.6	31
32	31.0	07.8	30.9	08.3	30.8	08.8	30.6	09.3	30.6	09.4	30.4	10.0	32
33	32.0	08.0	31.9	08.5	31.7	09.1	31.6	09.6	31.6	09.6	31.4	10.2	33
34	33.0	08.3	32.8	08.8	32.7	09.4	32.5	09.9	32.5	09.9	32.3	10.5	34
35	33.9	08.5	33.8	09.1	33.6	09.6	33.5	10.2	33.5	10.2	33.3	10.8	35
36	34.9	08.7	34.8	09.3	34.6	09.9	34.4	10.4	34.4	10.5	34.2	11.1	36
37	35.9	09.0	35.7	09.6	35.6	10.2	35.4	10.7	35.4	10.8	35.2	11.5	37
38	36.9	09.2	36.7	09.8	36.5	10.5	36.4	11.0	36.3	11.1	36.1	11.7	38
39	37.8	09.5	37.7	10.1	37.5	10.7	37.3	11.3	37.3	11.4	37.1	12.0	39
40	38.8	09.7	38.6	10.4	38.5	11.0	38.3	11.6	38.3	11.7	38.0	12.4	40
41	39.8	10.0	39.6	10.6	39.4	11.3	39.2	11.9	39.2	12.0	39.0	12.7	41
42	40.7	10.2	40.6	10.9	40.4	11.6	40.2	12.2	40.2	12.3	39.9	13.0	42
43	41.7	10.4	41.5	11.1	41.3	11.8	41.1	12.5	41.1	12.6	40.9	13.3	43
44	42.7	10.7	42.5	11.4	42.3	12.1	42.1	12.8	42.1	12.9	41.8	13.6	44
45	43.6	10.9	43.5	11.6	43.3	12.4	43.1	13.1	43.0	13.1	42.8	13.9	45
46	44.6	11.2	44.4	11.9	44.2	12.7	44.0	13.4	44.0	13.4	43.7	14.2	46
47	45.6	11.4	45.4	12.2	45.2	13.0	45.0	13.6	44.9	13.7	44.7	14.5	47
48	46.6	11.7	46.4	12.4	46.1	13.2	45.9	13.9	45.9	14.0	45.7	14.8	48
49	47.5	11.9	47.3	12.7	47.1	13.5	46.9	14.2	46.9	14.3	46.6	15.1	49
50	48.5	12.1	48.3	12.9	48.1	13.8	47.8	14.5	47.8	14.6	47.6	15.4	50
Diff	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Diff
	6 $\frac{1}{4}$ Point		75 Deg		74 Deg		6 $\frac{1}{2}$ Point		73 Deg		72 Deg		

Of LATITUDE and DEPARTURE.

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Diff.	1 1/4 Point		15 Deg.		16 Deg.		1 1/2 Point		17 Deg.		18 Deg.		Diff.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
51	49,5	12,4	49,3	13,2	49,0	14,1	48,8	14,8	48,8	14,9	48,5	15,8	51
52	50,4	12,6	50,2	13,5	50,0	14,3	49,7	15,1	49,7	15,2	49,4	16,1	52
53	51,4	12,9	51,2	13,7	50,9	14,6	50,7	15,3	50,7	15,5	50,4	16,4	53
54	52,4	13,1	52,2	14,0	51,9	14,9	51,7	15,7	51,6	15,8	51,3	16,7	54
55	53,3	13,4	53,1	14,2	52,9	15,2	52,6	16,0	52,6	16,1	52,3	17,0	55
56	54,3	13,6	54,1	14,5	53,8	15,4	53,6	16,2	53,5	16,4	53,3	17,3	56
57	55,3	13,9	55,1	14,8	54,8	15,7	54,5	16,5	54,5	16,7	54,2	17,6	57
58	56,3	14,1	56,0	15,0	55,8	16,0	55,5	16,8	55,5	17,0	55,2	17,9	58
59	57,2	14,3	57,0	15,3	56,7	16,3	56,5	17,1	56,4	17,3	56,1	18,2	59
60	58,2	14,6	58,0	15,5	57,7	16,5	57,4	17,4	57,4	17,5	57,1	18,5	60
61	59,2	14,8	58,9	15,8	58,6	16,8	58,4	17,7	58,3	17,8	58,0	18,8	61
62	60,1	15,1	59,9	16,0	59,6	17,1	59,3	18,0	59,3	18,1	59,0	19,2	62
63	61,1	15,3	60,9	16,3	60,6	17,4	60,3	18,3	60,2	18,4	59,9	19,5	63
64	62,1	15,6	61,8	16,6	61,5	17,6	61,2	18,6	61,2	18,7	60,9	19,8	64
65	63,0	15,8	62,8	16,8	62,5	17,9	62,2	18,9	62,2	19,0	61,8	20,1	65
66	64,0	16,0	63,7	17,1	63,4	18,2	63,2	19,2	63,1	19,3	62,8	20,4	66
67	65,0	16,3	64,7	17,3	64,4	18,5	64,1	19,4	64,1	19,6	63,7	20,7	67
68	66,0	16,5	65,7	17,6	65,4	18,7	65,1	19,7	65,0	19,9	64,7	21,0	68
69	66,9	16,8	66,6	17,9	66,3	19,0	66,0	20,0	66,0	20,2	65,6	21,3	69
70	67,9	17,0	67,6	18,1	67,3	19,3	67,0	20,3	66,9	20,5	66,6	21,6	70
71	68,9	17,3	68,6	18,4	68,3	19,6	67,9	20,6	67,9	20,8	67,5	21,9	71
72	69,8	17,5	69,5	18,6	69,2	19,8	68,9	20,9	68,8	21,1	68,5	22,2	72
73	70,8	17,7	70,5	18,9	70,2	20,1	69,9	21,2	69,8	21,3	69,4	22,6	73
74	71,8	18,0	71,5	19,2	71,1	20,4	70,8	21,5	70,8	21,6	70,4	22,9	74
75	72,7	18,2	72,4	19,4	72,1	20,7	71,8	21,8	71,7	21,9	71,3	23,2	75
76	73,7	18,5	73,4	19,7	73,1	20,9	72,7	22,1	72,7	22,2	72,3	23,5	76
77	74,7	18,7	74,4	19,9	74,0	21,2	73,7	22,4	73,6	22,5	73,2	23,8	77
78	75,7	18,9	75,3	20,2	75,0	21,5	74,6	22,6	74,6	22,8	74,2	24,1	78
79	76,6	19,2	76,3	20,4	75,9	21,8	75,6	22,9	75,5	23,1	75,1	24,4	79
80	77,6	19,4	77,3	20,7	76,9	22,0	76,6	23,2	76,5	23,4	76,1	24,7	80
81	78,6	19,7	78,2	21,0	77,9	22,3	77,5	23,5	77,5	23,7	77,0	25,0	81
82	79,5	19,9	79,2	21,2	78,8	22,6	78,5	23,8	78,4	24,0	78,0	25,3	82
83	80,5	20,2	80,2	21,5	79,8	22,9	79,4	24,1	79,4	24,3	78,9	25,6	83
84	81,5	20,4	81,1	21,7	80,7	23,1	80,4	24,4	80,3	24,5	79,9	26,0	84
85	82,4	20,7	82,1	22,0	81,7	23,4	81,3	24,7	81,3	24,8	80,8	26,3	85
86	83,4	20,9	83,1	22,3	82,7	23,7	82,3	25,0	82,2	25,1	81,8	26,6	86
87	84,4	21,1	84,0	22,5	83,6	24,0	83,3	25,3	83,2	25,4	82,7	26,9	87
88	85,4	21,4	85,0	22,8	84,6	24,3	84,2	25,5	84,2	25,7	83,7	27,2	88
89	86,3	21,6	86,0	23,0	85,6	24,5	85,2	25,8	85,1	26,0	84,6	27,5	89
90	87,3	21,9	86,9	23,3	86,5	24,8	86,1	26,1	86,1	26,3	85,6	27,8	90
91	88,3	22,1	87,9	23,5	87,5	25,1	87,1	26,4	87,0	26,6	86,5	28,1	91
92	89,2	22,4	88,9	23,8	88,4	25,4	88,0	26,7	88,0	26,9	87,5	28,4	92
93	90,2	22,6	89,8	24,1	89,4	25,6	89,0	27,0	88,9	27,2	88,4	28,7	93
94	91,2	22,8	90,8	24,3	90,4	25,9	90,0	27,3	89,9	27,5	89,4	29,0	94
95	92,1	23,1	91,8	24,6	91,3	26,2	90,9	27,6	90,8	27,8	90,4	29,4	95
96	93,1	23,3	92,7	24,8	92,3	26,5	91,9	27,9	91,8	28,1	91,3	29,7	96
97	94,1	23,6	93,7	25,1	93,2	26,7	92,8	28,2	92,8	28,4	92,3	30,0	97
98	95,1	23,8	94,7	25,4	94,2	27,0	93,8	28,4	93,7	28,7	93,2	30,3	98
99	96,0	24,1	95,6	25,6	95,2	27,3	94,7	28,7	94,7	28,9	94,2	30,6	99
100	97,0	24,3	96,6	25,9	96,1	27,6	95,7	29,0	95,6	29,2	95,1	30,9	100
	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	
	6 1/4 Point	75 Deg.	74 Deg.	6 1/2 Point	73 Deg.	72 Deg.							

Diff	19 Deg		1 $\frac{1}{4}$ Point		20 Deg		21 Deg		22 Deg		2 Points		Diff
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
1	00.9	00.3	00.9	00.3	00.9	00.3	00.9	00.4	00.9	00.4	00.9	00.4	1
2	01.9	00.7	01.9	00.7	01.9	00.7	01.9	00.7	01.9	00.7	01.8	00.8	2
3	02.8	01.0	02.8	01.0	02.8	01.0	02.8	01.1	02.8	01.1	02.8	01.1	3
4	03.8	01.3	03.8	01.3	03.8	01.4	03.7	01.4	03.7	01.5	03.7	01.5	4
5	04.7	01.6	04.7	01.7	04.7	01.7	04.7	01.8	04.6	01.9	04.6	01.9	5
6	05.7	02.0	05.6	02.0	05.6	02.1	05.6	02.1	05.6	02.2	05.5	02.3	6
7	06.6	02.3	06.6	02.4	06.6	02.4	06.5	02.5	06.5	02.6	06.5	02.7	7
8	07.6	02.6	07.5	02.7	07.5	02.7	07.5	02.9	07.4	03.0	07.4	03.1	8
9	08.5	02.9	08.5	03.0	08.5	03.1	08.4	03.2	08.3	03.4	08.3	03.4	9
10	09.5	03.3	09.4	03.4	09.4	03.4	09.3	03.6	09.3	03.7	09.2	03.8	10
11	10.4	03.6	10.4	03.7	10.3	03.8	10.3	03.9	10.2	04.1	10.2	04.2	11
12	11.3	03.9	11.3	04.0	11.3	04.1	11.2	04.3	11.1	04.5	11.1	04.6	12
13	12.3	04.2	12.2	04.4	12.2	04.4	12.2	04.7	12.1	04.9	12.0	05.0	13
14	13.2	04.6	13.2	04.7	13.2	04.8	13.1	05.0	13.0	05.2	12.9	05.4	14
15	14.2	04.9	14.1	05.1	14.1	05.1	14.0	05.4	13.9	05.6	13.9	05.7	15
16	15.1	05.2	15.1	05.4	15.0	05.5	14.9	05.7	14.8	06.0	14.8	06.1	16
17	16.1	05.5	16.0	05.7	16.0	05.8	15.9	06.1	15.8	06.4	15.7	06.5	17
18	17.0	05.9	16.9	06.1	16.9	06.2	16.8	06.5	16.7	06.7	16.6	06.9	18
19	18.0	06.2	17.9	06.4	17.9	06.5	17.7	06.8	17.6	07.1	17.6	07.3	19
20	18.9	06.5	18.8	06.7	18.8	06.8	18.7	07.2	18.5	07.5	18.5	07.7	20
21	19.9	06.8	19.8	07.1	19.7	07.2	19.6	07.5	19.5	07.9	19.4	08.0	21
22	20.8	07.2	20.7	07.4	20.7	07.5	20.5	07.9	20.4	08.2	20.3	08.4	22
23	21.7	07.5	21.7	07.7	21.6	07.9	21.5	08.2	21.3	08.6	21.2	08.8	23
24	22.7	07.8	22.6	08.1	22.6	08.2	22.4	08.6	22.3	09.0	22.2	09.2	24
25	23.6	08.1	23.5	08.4	23.5	08.5	23.3	09.0	23.2	09.4	23.1	09.6	25
26	24.6	08.5	24.5	08.8	24.4	08.9	24.3	09.3	24.1	09.7	24.0	09.9	26
27	25.5	08.8	25.4	09.1	25.4	09.2	25.2	09.7	25.0	10.1	24.9	10.2	27
28	26.5	09.1	26.4	09.4	26.3	09.6	26.1	10.0	26.0	10.5	25.9	10.7	28
29	27.4	09.4	27.3	09.8	27.3	09.9	27.1	10.4	26.9	10.9	26.8	11.1	29
30	28.4	09.8	28.2	10.1	28.2	10.3	28.0	10.8	27.8	11.2	27.7	11.5	30
31	29.3	10.1	29.2	10.4	29.1	10.6	28.9	11.1	28.7	11.6	28.6	11.9	31
32	30.3	10.4	30.1	10.8	30.1	10.9	29.9	11.5	29.7	12.0	29.6	12.3	32
33	31.2	10.7	31.1	11.1	31.0	11.3	30.8	11.8	30.6	12.4	30.5	12.6	33
34	32.1	11.1	32.0	11.5	31.9	11.6	31.7	12.2	31.5	12.7	31.4	13.0	34
35	33.1	11.4	33.0	11.8	32.9	12.0	32.7	12.5	32.5	13.1	32.3	13.4	35
36	34.0	11.7	33.9	12.1	33.8	12.3	33.6	12.9	33.4	13.5	33.3	13.8	36
37	35.0	12.0	34.8	12.5	34.8	12.7	34.5	13.3	34.3	13.9	34.2	14.2	37
38	35.9	12.4	35.8	12.8	35.7	13.0	35.5	13.6	35.2	14.2	35.1	14.5	38
39	36.9	12.7	36.7	13.1	36.6	13.3	36.4	14.0	36.2	14.6	36.0	14.9	39
40	37.8	13.0	37.7	13.5	37.6	13.7	37.3	14.3	37.1	15.0	37.0	15.3	40
41	38.8	13.3	38.6	13.8	38.5	14.0	38.3	14.7	38.0	15.4	37.9	15.7	41
42	39.7	13.7	39.5	14.1	39.5	14.4	39.2	15.1	38.9	15.7	38.8	16.1	42
43	40.7	14.0	40.5	14.5	40.4	14.7	40.1	15.4	39.9	16.1	39.7	16.5	43
44	41.6	14.3	41.4	14.8	41.3	15.0	41.1	15.8	40.8	16.5	40.7	16.8	44
45	42.5	14.7	42.4	15.2	42.3	15.4	42.0	16.1	41.7	16.9	41.6	17.2	45
46	43.5	15.0	43.3	15.5	43.2	15.7	42.9	16.5	42.7	17.2	42.5	17.6	46
47	44.4	15.3	44.2	15.8	44.2	16.1	43.9	16.8	43.6	17.6	43.4	18.0	47
48	45.4	15.6	45.2	16.2	45.1	16.4	44.8	17.2	44.5	18.0	44.3	18.4	48
49	46.3	16.0	46.1	16.5	46.0	16.8	45.7	17.6	45.4	18.4	45.3	18.8	49
50	47.3	16.3	47.1	16.8	47.5	17.1	46.7	17.9	46.4	18.7	46.2	19.1	50
Diff	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Diff
		71 Deg		6 $\frac{1}{4}$ Point		70 Deg		69 Deg		68 Deg		6 Points	

Of LATITUDE and DEPARTURE.

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Diff	19 Deg.		1 1/4 Point		20 Deg.		21 Deg.		22 Deg.		2 Points		Diff
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
51	48.2	16,6	48,0	17,2	47,9	17,4	47,6	18,3	47,3	19,1	47,1	19,5	51
52	49.2	16,9	49,0	17,5	48,9	17,8	48,5	18,6	48,2	19,5	48,0	19,9	52
53	50.1	17,3	49,9	17,9	49,8	18,1	49,5	19,0	49,1	19,9	49,0	20,3	53
54	51.0	17,6	50,8	18,2	50,7	18,5	50,4	19,4	50,1	20,2	49,9	20,7	54
55	52.0	17,9	51,8	18,5	51,7	18,8	51,3	19,7	51,0	20,6	50,8	21,0	55
56	52.9	18,2	52,7	18,9	52,6	19,2	52,3	20,1	51,9	21,0	51,7	21,4	56
57	53.9	18,6	53,7	19,2	53,6	19,5	53,2	20,4	52,8	21,4	52,7	21,8	57
58	54.8	18,9	54,6	19,5	54,5	19,8	54,1	20,8	53,8	21,7	53,6	22,2	58
59	55.8	19,2	55,5	19,9	55,4	20,2	55,1	21,1	54,7	22,1	54,5	22,6	59
60	56.7	19,5	56,5	20,2	56,4	20,5	56,0	21,5	55,6	22,5	55,4	23,0	60
61	57.7	19,9	57,4	20,6	57,3	20,9	56,9	21,9	56,5	22,8	56,4	23,3	61
62	58.6	20,2	58,4	20,9	58,3	21,2	57,9	22,2	57,5	23,2	57,3	23,7	62
63	59.6	20,5	59,3	21,2	59,2	21,5	58,8	22,6	58,4	23,6	58,2	24,1	63
64	60.5	20,8	60,3	21,6	60,1	21,9	59,7	22,9	59,3	24,0	59,1	24,5	64
65	61.5	21,2	61,2	21,9	61,1	22,2	60,7	23,3	60,3	24,3	60,1	24,9	65
66	62.4	21,5	62,1	22,2	62,0	22,6	61,6	23,7	61,2	24,7	61,0	25,3	66
67	63.3	21,8	63,1	22,6	63,0	22,9	62,6	24,0	62,1	25,1	61,9	25,6	67
68	64.3	22,1	64,0	22,9	63,9	23,3	63,5	24,4	63,0	25,5	62,8	26,0	68
69	65.2	22,5	65,0	23,2	64,8	23,6	64,4	24,7	64,0	25,8	63,7	26,4	69
70	66.2	22,8	65,9	23,6	65,8	23,9	65,4	25,1	64,9	26,2	64,7	26,8	70
71	67.1	23,1	66,8	23,9	66,7	24,3	66,3	25,4	65,8	26,6	65,6	27,2	71
72	68.1	23,4	67,8	24,3	67,7	24,6	67,2	25,8	66,8	27,0	66,5	27,6	72
73	69.0	23,8	68,7	24,6	68,6	25,0	68,2	26,2	67,7	27,3	67,4	27,9	73
74	70.0	24,1	69,7	24,9	69,5	25,3	69,1	26,5	68,6	27,7	68,4	28,3	74
75	70.9	24,4	70,6	25,3	70,5	25,6	70,0	26,9	69,5	28,1	69,3	28,7	75
76	71.9	24,7	71,6	25,6	71,4	26,0	71,0	27,2	70,5	28,5	70,2	29,1	76
77	72.8	25,1	72,5	25,9	72,4	26,3	71,9	27,6	71,4	28,8	71,1	29,5	77
78	73.7	25,4	73,4	26,3	73,3	26,7	72,8	28,0	72,3	29,2	72,1	29,8	78
79	74.7	25,7	74,4	26,6	74,2	27,0	73,8	28,3	73,2	29,6	73,0	30,2	79
80	75.6	26,0	75,3	27,0	75,2	27,4	74,7	28,7	74,2	30,0	73,9	30,6	80
81	76.6	26,4	76,3	27,3	76,1	27,7	75,6	29,0	75,1	30,3	74,8	31,0	81
82	77.5	26,7	77,2	27,6	77,1	28,0	76,6	29,4	76,0	30,7	75,8	31,4	82
83	78.5	27,0	78,1	28,0	78,0	28,4	77,5	29,7	77,0	31,1	76,7	31,8	83
84	79.4	27,3	79,1	28,3	78,9	28,7	78,4	30,1	77,9	31,5	77,6	32,1	84
85	80.4	27,7	80,0	28,6	79,9	29,1	79,4	30,5	78,8	31,8	78,5	32,5	85
86	81.3	28,0	81,0	29,0	80,8	29,4	80,3	30,8	79,7	32,2	79,5	32,9	86
87	82.3	28,3	81,9	29,3	81,8	29,8	81,2	31,2	80,7	32,6	80,4	33,3	87
88	83.2	28,7	82,9	29,6	82,7	30,1	82,2	31,5	81,6	33,0	81,3	33,7	88
89	84.1	29,0	83,8	30,0	83,6	30,4	83,1	31,9	82,5	33,3	82,2	34,1	89
90	85.1	29,3	84,7	30,3	84,6	30,8	84,0	32,3	83,4	33,7	83,2	34,4	90
91	86.0	29,6	85,7	30,7	85,5	31,1	85,0	32,6	84,4	34,1	84,1	34,8	91
92	87.0	30,0	86,6	31,0	86,5	31,5	85,9	33,0	85,3	34,5	85,0	35,2	92
93	87.9	30,3	87,6	31,3	87,4	31,8	86,8	33,3	86,2	34,8	85,9	35,6	93
94	88.9	30,6	88,5	31,7	88,3	32,1	87,8	33,7	87,2	35,2	86,8	36,0	94
95	89.8	30,9	89,4	32,0	89,3	32,5	88,7	34,0	88,1	35,6	87,8	36,4	95
96	90.8	31,3	90,4	32,3	90,2	32,8	89,6	34,4	89,0	36,0	88,7	36,7	96
97	91.7	31,6	91,3	32,7	91,1	33,2	90,6	34,8	89,9	36,3	89,6	37,1	97
98	92.7	31,9	92,3	33,0	92,1	33,5	91,5	35,1	90,9	36,7	90,5	37,5	98
99	93.6	32,2	93,2	33,4	93,0	33,9	92,4	35,5	91,8	37,1	91,5	37,9	99
100	94.5	32,6	94,2	33,7	94,0	34,2	93,4	35,8	92,7	37,5	92,4	38,3	100
Diff	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Diff
	71 Deg.		6 1/4 Point		70 Deg.		69 Deg.		68 Deg.		6 Points		

Diff.	23 Deg.		24 Deg.		25 Deg.		26 Point		26 Deg.		27 Deg.		Diff.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
1	00.9	00.4	00.9	00.4	00.9	00.4	00.9	00.4	00.9	00.4	00.9	00.5	1
2	01.8	00.8	01.8	00.8	01.8	00.8	01.8	00.9	01.8	00.9	01.8	00.9	2
3	02.8	01.2	02.7	01.2	02.7	01.3	02.7	01.3	02.7	01.3	02.7	01.4	3
4	03.7	01.6	03.6	01.6	03.6	01.7	03.6	01.7	03.6	01.8	03.6	01.8	4
5	04.6	02.0	04.6	02.0	04.5	02.1	04.5	02.1	04.5	02.2	04.5	02.3	5
6	05.5	02.3	05.5	02.4	05.4	02.5	05.4	02.6	05.4	02.6	05.3	02.7	6
7	06.4	02.7	06.4	02.8	06.3	03.0	06.3	03.0	06.3	03.1	06.2	03.2	7
8	07.4	03.1	07.3	03.3	07.2	03.4	07.2	03.4	07.2	03.5	07.1	03.6	8
9	08.3	03.5	08.2	03.7	08.2	03.8	08.1	03.8	08.1	03.9	08.0	04.1	9
10	09.2	03.9	09.1	04.1	09.1	04.2	09.0	04.3	09.0	04.4	08.9	04.5	10
11	10.1	04.3	10.0	04.5	10.0	04.6	09.9	04.7	09.9	04.8	09.8	05.0	11
12	11.0	04.7	11.0	04.9	10.9	05.1	10.8	05.1	10.8	05.3	10.7	05.4	12
13	12.0	05.1	11.9	05.3	11.8	05.5	11.8	05.6	11.7	05.7	11.6	05.9	13
14	12.9	05.5	12.8	05.7	12.7	05.9	12.7	06.0	12.6	06.1	12.5	06.4	14
15	13.8	05.9	13.7	06.1	13.6	06.3	13.6	06.4	13.5	06.6	13.4	06.8	15
16	14.7	06.2	14.6	06.5	14.5	06.8	14.5	06.8	14.4	06.9	14.3	07.3	16
17	15.6	06.6	15.5	06.9	15.4	07.2	15.4	07.3	15.3	07.5	15.1	07.7	17
18	16.6	07.0	16.4	07.3	16.3	07.6	16.3	07.7	16.2	07.9	16.0	08.2	18
19	17.5	07.4	17.4	07.7	17.2	08.0	17.2	08.1	17.1	08.3	16.9	08.6	19
20	18.4	07.8	18.3	08.1	18.1	08.5	18.1	08.6	18.0	08.8	17.8	09.1	20
21	19.3	08.2	19.2	08.5	19.0	08.9	19.0	09.0	18.9	09.2	18.7	09.5	21
22	20.3	08.6	20.1	08.9	19.9	09.3	19.9	09.4	19.8	09.6	19.6	10.0	22
23	21.2	09.0	21.0	09.4	20.8	09.7	20.8	09.8	20.7	10.1	20.5	10.4	23
24	22.1	09.4	21.9	09.8	21.8	10.1	21.7	10.3	21.6	10.5	21.4	10.9	24
25	23.0	09.8	22.8	10.2	22.7	10.6	22.6	10.7	22.5	11.0	22.3	11.3	25
26	23.9	10.2	23.8	10.6	23.6	11.0	23.5	11.1	23.4	11.4	23.2	11.8	26
27	24.9	10.5	24.7	11.0	24.5	11.4	24.4	11.5	24.3	11.8	24.1	12.3	27
28	25.8	10.9	25.6	11.4	25.4	11.8	25.3	12.0	25.2	12.3	24.9	12.7	28
29	26.7	11.3	26.5	11.8	26.3	12.3	26.2	12.4	26.1	12.7	25.8	13.2	29
30	27.6	11.7	27.4	12.2	27.2	12.7	27.1	12.8	27.0	13.2	26.7	13.6	30
31	28.5	12.1	28.3	12.6	28.1	13.1	28.0	13.3	27.9	13.6	27.6	14.1	31
32	29.5	12.5	29.2	13.0	29.0	13.5	28.9	13.7	28.8	14.0	28.5	14.5	32
33	30.4	12.9	30.1	13.4	29.9	13.9	29.8	14.1	29.7	14.5	29.4	15.0	33
34	31.3	13.3	31.1	13.8	30.8	14.4	30.7	14.5	30.6	14.9	30.3	15.4	34
35	32.2	13.7	32.0	14.2	31.7	14.8	31.6	15.0	31.5	15.3	31.2	15.9	35
36	33.1	14.1	32.9	14.6	32.6	15.2	32.5	15.4	32.4	15.8	32.1	16.3	36
37	34.1	14.5	33.8	15.0	33.5	15.6	33.4	15.8	33.3	16.2	33.0	16.8	37
38	35.0	14.8	34.7	15.5	34.4	16.1	34.4	16.2	34.2	16.7	33.9	17.3	38
39	35.9	15.2	35.6	15.9	35.3	16.5	35.3	16.7	35.1	17.1	34.7	17.7	39
40	36.8	15.6	36.5	16.3	36.3	16.9	36.2	17.1	36.0	17.5	35.6	18.2	40
41	37.7	16.0	37.5	16.7	37.2	17.3	37.1	17.5	36.8	18.0	36.5	18.6	41
42	38.7	16.4	38.4	17.1	38.1	17.7	38.0	18.0	37.7	18.4	37.4	19.1	42
43	39.6	16.8	39.3	17.5	39.0	18.2	38.9	18.1	38.6	18.9	38.3	19.5	43
44	40.5	17.2	40.2	17.9	39.9	18.6	39.8	18.8	39.5	19.3	39.2	20.0	44
45	41.4	17.6	41.1	18.3	40.8	19.0	40.7	19.2	40.4	19.7	40.1	20.4	45
46	42.3	18.0	42.0	18.7	41.7	19.4	41.6	19.7	41.3	20.2	41.0	20.9	46
47	43.3	18.4	42.9	19.1	42.6	19.9	42.5	20.1	42.2	20.6	41.9	21.3	47
48	44.2	18.8	43.8	19.5	43.5	20.3	43.4	20.5	43.1	21.0	42.8	21.8	48
49	45.1	19.1	44.8	19.9	44.4	20.7	44.3	20.9	44.0	21.5	43.7	22.2	49
50	46.0	19.5	45.7	20.3	45.3	21.1	45.2	21.4	44.9	21.9	44.6	22.7	50
Diff.	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Diff.
	67 Deg.		66 Deg.		65 Deg.		54 Point		64 Deg.		63 Deg.		

Of LATITUDE and DEPARTURE.

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Diff.	23 Deg.		24 Deg.		25 Deg.		2½ Point		26 Deg.		27 Deg.		Diff.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
51	46.9	19.9	46.6	20.7	46.2	21.6	46.1	21.8	45.8	22.4	45.4	23.2	51
52	47.9	20.3	47.5	21.1	47.1	22.0	47.0	22.2	46.7	22.8	46.3	23.6	52
53	48.8	20.7	48.4	21.6	48.0	22.4	47.9	22.7	47.6	23.2	47.2	24.1	53
54	49.7	21.1	49.3	22.0	48.9	22.8	48.8	23.1	48.5	23.7	48.1	24.5	54
55	50.6	21.5	50.2	22.4	49.8	23.2	49.7	23.5	49.4	24.1	49.0	25.0	55
56	51.5	21.9	51.2	22.8	50.8	23.7	50.6	23.9	50.3	24.5	49.9	25.4	56
57	52.5	22.3	52.1	23.2	51.7	24.1	51.5	24.4	51.2	25.0	50.8	25.9	57
58	53.4	22.7	53.0	23.6	52.6	24.5	52.4	24.8	52.1	25.4	51.7	26.3	58
59	54.3	23.1	53.9	24.0	53.5	24.9	53.3	25.2	53.0	25.9	52.6	26.8	59
60	55.2	23.4	54.8	24.4	54.4	25.4	54.2	25.7	53.9	26.3	53.5	27.2	60
61	56.1	23.8	55.7	24.8	55.3	25.8	55.1	26.1	54.8	26.7	54.4	27.7	61
62	57.1	24.2	56.6	25.2	56.2	26.2	56.0	26.5	55.7	27.2	55.2	28.1	62
63	58.0	24.6	57.5	25.6	57.1	26.6	57.0	26.9	56.6	27.6	56.1	28.6	63
64	58.9	25.0	58.5	26.0	58.0	27.0	57.9	27.4	57.5	28.1	57.0	29.1	64
65	59.8	25.4	59.4	26.4	58.9	27.5	58.8	27.8	58.4	28.5	57.9	29.5	65
66	60.8	25.8	60.3	26.8	59.8	27.9	59.7	28.2	59.3	28.9	58.8	30.0	66
67	61.7	26.2	61.2	27.2	60.7	28.3	60.6	28.6	60.2	29.4	59.7	30.4	67
68	62.6	26.6	62.1	27.7	61.0	28.7	61.5	29.1	61.1	29.8	60.6	30.9	68
69	63.5	27.0	63.0	28.1	62.5	29.2	62.4	29.5	62.0	30.2	61.5	31.3	69
70	64.4	27.3	63.9	28.5	63.4	29.6	63.3	29.9	62.9	30.7	62.4	31.8	70
71	65.4	27.7	64.9	28.9	64.3	30.0	64.2	30.4	63.8	31.1	63.3	32.2	71
72	66.3	28.1	65.8	29.3	65.3	30.4	65.1	30.8	64.7	31.6	64.2	32.7	72
73	67.2	28.5	66.7	29.7	66.2	30.8	66.0	31.2	65.6	32.0	65.0	33.1	73
74	68.1	28.9	67.6	30.1	67.1	31.3	66.9	31.6	66.5	32.4	65.9	33.6	74
75	69.0	29.3	68.5	30.5	68.0	31.7	67.8	32.1	67.4	32.9	66.8	34.1	75
76	70.0	29.7	69.4	30.9	68.9	32.1	68.7	32.5	68.3	33.3	67.7	34.5	76
77	70.9	30.1	70.3	31.3	69.8	32.5	69.6	32.9	69.2	33.8	68.6	35.0	77
78	71.8	30.5	71.3	31.7	70.7	33.0	70.5	33.3	70.1	34.2	69.5	35.4	78
79	72.7	30.9	72.2	32.1	71.6	33.4	71.4	33.8	71.0	34.6	70.4	35.9	79
80	73.6	31.3	73.1	32.5	72.5	33.8	72.3	34.2	71.9	35.1	71.3	36.3	80
81	74.6	31.6	74.0	32.9	73.4	34.2	73.2	34.6	72.8	35.5	72.2	36.8	81
82	75.5	32.0	74.9	33.3	74.3	34.7	74.1	35.1	73.7	35.9	73.1	37.2	82
83	76.4	32.4	75.8	33.7	75.2	35.1	75.0	35.5	74.6	36.4	74.0	37.7	83
84	77.3	32.8	76.7	34.1	76.1	35.5	75.9	35.9	75.5	36.8	74.8	38.1	84
85	78.2	33.2	77.6	34.6	77.0	35.9	76.8	36.3	76.4	37.3	75.7	38.6	85
86	79.2	33.6	78.6	35.0	77.9	36.3	77.7	36.8	77.3	37.7	76.6	39.0	86
87	80.1	34.0	79.5	35.4	78.8	36.8	78.6	37.2	78.2	38.1	77.5	39.5	87
88	81.0	34.4	80.4	35.8	79.8	37.2	79.6	37.6	79.1	38.6	78.4	40.0	88
89	81.9	34.8	81.3	36.2	80.7	37.6	80.5	38.1	80.0	39.0	79.3	40.4	89
90	82.8	35.2	82.2	36.6	81.6	38.0	81.4	38.5	80.9	39.5	80.2	40.9	90
91	83.8	35.6	83.1	37.0	82.5	38.5	82.3	38.9	81.8	39.9	81.1	41.3	91
92	84.7	35.9	84.0	37.4	83.4	38.9	83.2	39.3	82.7	40.3	82.0	41.8	92
93	85.6	36.3	85.0	37.8	84.3	39.3	84.1	39.8	83.6	40.8	82.9	42.2	93
94	86.5	36.7	85.9	38.2	85.2	39.7	85.0	40.2	84.5	41.2	83.8	42.7	94
95	87.4	37.1	86.8	38.6	86.1	40.1	85.9	40.6	85.4	41.6	84.6	43.1	95
96	88.3	37.5	87.7	39.0	87.0	40.6	86.8	41.0	86.3	42.1	85.5	43.6	96
97	89.3	37.9	88.6	39.4	87.9	41.0	87.7	41.5	87.2	42.5	86.4	44.0	97
98	90.2	38.4	89.5	39.9	88.8	41.4	88.6	41.9	88.1	43.0	87.3	44.5	98
99	91.2	38.7	90.4	40.3	89.7	41.8	89.5	42.3	89.0	43.4	88.2	44.9	99
100	92.0	39.1	91.4	40.7	90.6	42.3	90.4	42.8	89.9	43.8	89.1	45.4	100
Diff.	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Diff.
	67 Deg.		66 Deg.		65 Deg.		5½ Point		64 Deg.		63 Deg.		

A Table of DIFFERENCE

Diff	28 Deg.		2½ Point		29 Deg.		30 Deg.		2¼ Point		31 Deg.		Diff
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
1	00,9	00,5	00,9	00,5	00,9	00,5	00,9	00,5	00,9	00,5	00,9	00,5	1
2	01,8	00,9	01,8	00,9	01,7	01,0	01,7	01,0	01,7	01,0	01,7	01,0	2
3	02,6	01,4	02,6	01,4	02,6	01,5	02,6	01,5	02,6	01,5	02,6	01,5	3
4	03,5	01,9	03,5	01,9	03,5	01,9	03,5	02,0	03,4	02,1	03,4	02,1	4
5	04,4	02,3	04,4	02,4	04,4	02,4	04,3	02,5	04,3	02,6	04,3	02,6	5
6	05,3	02,8	05,3	02,8	05,2	02,9	05,2	03,0	05,1	03,1	05,1	03,1	6
7	06,2	03,3	06,2	03,3	06,1	03,4	06,1	03,5	06,0	03,6	06,0	03,6	7
8	07,1	03,8	07,1	03,8	07,0	03,9	06,9	04,0	06,9	04,1	06,9	04,1	8
9	07,9	04,2	07,9	04,2	07,9	04,4	07,8	04,5	07,7	04,6	07,7	04,6	9
10	08,8	04,7	08,8	04,7	08,7	04,8	08,7	05,0	08,6	05,1	08,6	05,1	10
11	09,7	05,2	09,7	05,2	09,6	05,3	09,5	05,5	09,4	05,7	09,4	05,7	11
12	10,6	05,6	10,6	05,7	10,5	05,8	10,4	06,0	10,3	06,2	10,3	06,2	12
13	11,5	06,1	11,5	06,1	11,4	06,3	11,3	06,5	11,1	06,7	11,1	06,7	13
14	12,4	06,6	12,3	06,6	12,2	06,8	12,1	07,0	12,0	07,2	12,0	07,2	14
15	13,2	07,0	13,2	07,1	13,1	07,3	13,0	07,5	12,9	07,7	12,9	07,7	15
16	14,1	07,5	14,1	07,5	14,0	07,8	13,9	08,0	13,7	08,2	13,7	08,2	16
17	15,0	08,0	15,0	08,0	14,9	08,2	14,7	08,5	14,6	08,7	14,6	08,8	17
18	15,9	08,5	15,9	08,5	15,7	08,7	15,6	09,0	15,4	09,3	15,4	09,3	18
19	16,8	08,9	16,8	09,0	16,6	09,2	16,5	09,5	16,3	09,8	16,3	09,8	19
20	17,7	09,4	17,6	09,4	17,5	09,7	17,3	10,0	17,2	10,3	17,2	10,3	20
21	18,5	09,9	18,5	09,9	18,4	10,2	18,2	10,5	18,0	10,8	18,0	10,8	21
22	19,4	10,3	19,4	10,4	19,2	10,7	19,1	11,0	18,9	11,3	18,9	11,3	22
23	20,3	10,8	20,3	10,8	20,1	11,1	19,9	11,5	19,7	11,8	19,7	11,8	23
24	21,2	11,3	21,2	11,3	21,0	11,6	20,8	12,0	20,6	12,3	20,6	12,3	24
25	22,1	11,7	22,0	11,8	21,9	12,1	21,6	12,5	21,4	12,9	21,4	12,9	25
26	23,0	12,2	22,9	12,3	22,7	12,6	22,5	13,0	22,3	13,4	22,3	13,4	26
27	23,8	12,7	23,8	12,7	23,6	13,1	23,4	13,5	23,2	13,9	23,1	13,9	27
28	24,7	13,1	24,7	13,2	24,5	13,6	24,2	14,0	24,0	14,4	24,0	14,4	28
29	25,6	13,6	25,6	13,7	25,4	14,1	25,1	14,5	24,9	14,9	24,9	14,9	29
30	26,5	14,1	26,5	14,1	26,2	14,5	26,0	15,0	25,7	15,4	25,7	15,4	30
31	27,4	14,6	27,3	14,6	27,1	15,0	26,8	15,5	26,6	15,9	26,6	16,0	31
32	28,3	15,0	28,2	15,1	28,0	15,5	27,7	16,0	27,4	16,4	27,4	16,5	32
33	29,1	15,5	29,1	15,6	28,9	16,0	28,6	16,5	28,3	17,0	28,3	17,0	33
34	30,0	16,0	30,0	16,0	29,7	16,5	29,4	17,0	29,2	17,5	29,1	17,5	34
35	30,9	16,4	30,9	16,5	30,6	17,0	30,3	17,5	30,0	18,0	30,0	18,0	35
36	31,8	16,9	31,7	17,0	31,5	17,5	31,2	18,0	30,9	18,5	30,9	18,5	36
37	32,7	17,4	32,6	17,4	32,4	17,9	32,0	18,5	31,7	19,0	31,7	19,1	37
38	33,5	17,8	33,5	17,9	33,2	18,4	32,9	19,0	32,6	19,5	32,6	19,6	38
39	34,4	18,3	34,4	18,4	34,1	18,9	33,8	19,5	33,4	20,0	33,4	20,1	39
40	35,3	18,8	35,3	18,9	35,0	19,4	34,6	20,0	34,3	20,6	34,3	20,6	40
41	36,2	19,2	36,2	19,3	35,9	19,9	35,5	20,5	35,2	21,1	35,1	21,1	41
42	37,1	19,7	37,0	19,8	36,7	20,4	36,4	21,0	36,0	21,6	36,0	21,6	42
43	38,0	20,2	37,9	20,3	37,6	20,8	37,2	21,5	36,9	22,1	36,9	22,1	43
44	38,8	20,7	38,8	20,7	38,5	21,3	38,1	22,0	37,7	22,6	37,7	22,7	44
45	39,7	21,1	39,7	21,2	39,4	21,8	39,0	22,5	38,6	23,1	38,6	23,2	45
46	40,6	21,6	40,6	21,7	40,2	22,3	39,8	23,0	39,5	23,6	39,4	23,7	46
47	41,5	22,1	41,4	22,2	41,1	22,8	40,7	23,5	40,3	24,2	40,3	24,2	47
48	42,4	22,5	42,3	22,6	42,0	23,3	41,6	24,0	41,2	24,7	41,1	24,7	48
49	43,3	23,0	43,2	23,1	42,9	23,8	42,4	24,5	42,0	25,2	42,0	25,2	49
50	44,1	23,5	44,1	23,6	43,6	24,2	43,3	25,0	42,9	25,7	42,9	25,7	50
Diff	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Diff
	62 Deg.		5½ Point		61 Deg.		60 Deg.		5¼ Point		59 Deg.		

Of LATITUDE and DEPARTURE.

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Diff	28 Deg.		2½ Point		29 Deg.		30 Deg.		2¾ Point		31 Deg.		Diff
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
51	45.0	23.9	45.0	24.0	44.6	24.7	44.2	25.5	43.7	26.2	43.7	26.3	51
52	45.9	24.4	45.9	24.5	45.5	25.2	45.0	26.0	44.6	26.7	44.6	26.8	52
53	46.8	24.9	46.7	25.0	46.4	25.7	45.9	26.5	45.5	27.2	45.4	27.3	53
54	47.7	25.4	47.6	25.5	47.2	26.2	46.8	27.0	46.3	27.8	46.3	27.8	54
55	48.6	25.8	48.5	25.9	48.1	26.7	47.6	27.5	47.2	28.3	47.1	28.3	55
56	49.4	26.3	49.4	26.4	49.0	27.1	48.5	28.0	48.0	28.8	48.0	28.8	56
57	50.3	26.8	50.3	26.9	49.9	27.6	49.4	28.5	48.9	29.3	48.9	29.4	57
58	51.2	27.2	51.2	27.3	50.7	28.1	50.2	29.0	49.7	29.8	49.7	29.9	58
59	52.1	27.7	52.0	27.8	51.6	28.6	51.1	29.5	50.6	30.3	50.6	30.4	59
60	53.0	28.2	52.9	28.3	52.5	29.1	52.0	30.0	51.5	30.8	51.4	30.9	60
61	53.9	28.6	53.8	28.8	53.3	29.6	52.8	30.5	52.3	31.4	52.3	31.4	61
62	54.7	29.1	54.7	29.2	54.2	30.1	53.7	31.0	53.2	31.9	53.1	31.9	62
63	55.6	29.6	55.6	29.7	55.1	30.5	54.6	31.5	54.0	32.4	54.0	32.4	63
64	56.5	30.0	56.4	30.2	56.0	31.0	55.4	32.0	54.9	32.9	54.9	33.0	64
65	57.4	30.5	57.3	30.6	56.8	31.5	56.3	32.5	55.7	33.4	55.7	33.5	65
66	58.3	31.0	58.2	31.1	57.7	32.0	57.2	33.0	56.6	33.9	56.6	34.0	66
67	59.2	31.5	59.1	31.6	58.6	32.5	58.0	33.5	57.5	34.4	57.4	34.5	67
68	60.0	31.9	60.0	32.1	59.5	33.0	58.9	34.0	58.3	35.0	58.3	35.0	68
69	60.9	32.4	60.9	32.5	60.3	33.5	59.8	34.5	59.2	35.5	59.1	35.5	69
70	61.8	32.9	61.7	33.0	61.2	33.9	60.6	35.0	60.0	36.0	60.0	36.0	70
71	62.7	33.3	62.6	33.5	62.1	34.4	61.5	35.5	60.9	36.5	60.9	36.6	71
72	63.6	33.8	63.5	33.9	63.0	34.9	62.4	36.0	61.8	37.0	61.7	37.1	72
73	64.5	34.3	64.4	34.4	63.8	35.4	63.2	36.5	62.6	37.5	62.6	37.6	73
74	65.3	34.7	65.3	34.9	64.7	35.9	64.0	37.0	63.5	38.0	63.4	38.1	74
75	66.2	35.2	66.1	35.4	65.6	36.4	64.9	37.5	64.3	38.6	64.3	38.6	75
76	67.1	35.7	67.0	35.8	66.5	36.8	65.8	38.0	65.2	39.1	65.1	39.1	76
77	68.0	36.2	67.9	36.3	67.3	37.3	66.7	38.5	66.0	39.6	66.0	39.7	77
78	68.9	36.6	68.8	36.8	68.2	37.8	67.5	39.0	66.9	40.1	66.9	40.2	78
79	69.7	37.1	69.7	37.2	69.1	38.3	68.4	39.5	67.8	40.6	67.7	40.7	79
80	70.6	37.6	70.6	37.7	70.0	38.8	69.3	40.0	68.6	41.1	68.6	41.2	80
81	71.5	38.0	71.4	38.2	70.8	39.3	70.1	40.5	69.5	41.6	69.4	41.7	81
82	72.4	38.5	72.3	38.6	71.7	39.8	71.0	41.0	70.3	42.2	70.3	42.2	82
83	73.3	39.0	73.2	39.1	72.6	40.2	71.9	41.5	71.2	42.7	71.1	42.7	83
84	74.2	39.4	74.1	39.6	73.5	40.7	72.7	42.0	72.0	43.2	72.0	43.3	84
85	75.0	39.9	75.0	40.1	74.3	41.2	73.6	42.5	72.9	43.7	72.9	43.8	85
86	75.9	40.4	75.8	40.5	75.2	41.7	74.5	43.0	73.8	44.2	73.7	44.3	86
87	76.8	40.8	76.7	41.0	76.1	42.2	75.3	43.5	74.6	44.7	74.6	44.8	87
88	77.7	41.3	77.6	41.5	77.0	42.7	76.2	44.0	75.5	45.2	75.4	45.3	88
89	78.6	41.8	78.5	42.0	77.8	43.1	77.1	44.5	76.3	45.8	76.3	45.8	89
90	79.5	42.3	79.4	42.4	78.7	43.6	77.9	45.0	77.2	46.3	77.1	46.3	90
91	80.3	42.7	80.3	42.9	79.6	44.1	78.8	45.5	78.1	46.8	78.0	46.9	91
92	81.2	43.2	81.1	43.4	80.5	44.6	79.7	46.0	78.9	47.3	78.9	47.4	92
93	82.1	43.7	82.0	43.8	81.3	45.1	80.5	46.5	79.8	47.8	79.7	47.9	93
94	83.0	44.1	82.9	44.3	82.2	45.6	81.4	47.0	80.6	48.3	80.6	48.4	94
95	83.9	44.6	83.8	44.8	83.1	46.1	82.3	47.5	81.5	48.8	81.4	48.9	95
96	84.8	45.1	84.7	45.2	84.0	46.5	83.1	48.0	82.3	49.3	82.3	49.4	96
97	85.6	45.5	85.5	45.7	84.8	47.0	84.0	48.5	83.2	49.9	83.1	50.0	97
98	86.5	46.0	86.4	46.2	85.7	47.5	84.9	49.0	84.1	50.4	84.0	50.5	98
99	87.4	46.5	87.3	46.7	86.6	48.0	85.7	49.5	84.9	50.9	84.9	51.0	99
100	88.3	46.9	88.2	47.1	87.5	48.5	86.6	50.0	85.8	51.4	85.7	51.5	100
Diff	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Diff
	62 Deg.		5½ Point		61 Deg.		60 Deg.		5¼ Point		59 Deg.		

Diff.	32 Deg.		33 Deg.		3 Points		34 Deg.		35 Deg.		36 Deg.		Diff.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
1	00.8	00.5	00.8	00.5	00.8	00.6	00.8	00.6	00.8	00.6	00.8	00.6	1
2	01.7	01.1	01.7	01.1	01.7	01.1	01.6	01.1	01.6	01.1	01.6	01.2	2
3	02.5	01.6	02.5	01.6	02.5	01.7	02.5	01.7	02.5	01.7	02.4	01.8	3
4	03.4	02.1	03.4	02.2	03.3	02.2	03.3	02.2	03.3	02.3	03.2	02.4	4
5	04.2	02.6	04.2	02.7	04.2	02.8	04.1	02.8	04.1	02.9	04.0	02.9	5
6	05.1	03.2	05.0	03.3	05.0	03.3	05.0	03.3	04.9	03.4	04.9	03.5	6
7	05.9	03.7	05.9	03.8	05.8	03.9	05.8	03.9	05.7	04.0	05.7	04.1	7
8	06.8	04.2	06.7	04.4	06.6	04.4	06.6	04.5	06.6	04.6	06.5	04.7	8
9	07.6	04.8	07.5	04.9	07.5	05.0	07.5	05.0	07.4	05.2	07.3	05.3	9
10	08.5	05.3	08.4	05.4	08.3	05.6	08.3	05.6	08.2	05.7	08.1	05.9	10
11	09.3	05.8	09.2	06.0	09.1	06.1	09.1	06.2	09.0	06.3	08.9	06.5	11
12	10.2	06.4	10.1	06.5	10.0	06.7	09.9	06.7	09.8	06.9	09.7	07.0	12
13	11.0	06.9	10.9	07.1	10.8	07.2	10.8	07.3	10.6	07.5	10.5	07.6	13
14	11.9	07.4	11.7	07.6	11.6	07.8	11.6	07.8	11.5	08.0	11.3	08.2	14
15	12.7	07.9	12.6	08.2	12.5	08.3	12.4	08.3	12.3	08.6	12.1	08.8	15
16	13.6	08.5	13.4	08.7	13.3	08.9	13.3	08.9	13.1	09.2	12.9	09.4	16
17	14.4	09.0	14.3	09.3	14.1	09.4	14.1	09.5	13.9	09.8	13.8	10.0	17
18	15.3	09.5	15.1	09.8	15.0	10.0	14.9	10.1	14.7	10.3	14.6	10.6	18
19	16.1	10.1	15.9	10.3	15.8	10.6	15.8	10.6	15.6	10.9	15.4	11.2	19
20	17.0	10.6	16.8	10.9	16.6	11.1	16.6	11.2	16.4	11.5	16.2	11.8	20
21	17.8	11.1	17.6	11.4	17.5	11.7	17.4	11.7	17.2	12.0	17.0	12.3	21
22	18.7	11.7	18.5	12.0	18.3	12.2	18.2	12.3	18.0	12.6	17.8	12.9	22
23	19.5	12.2	19.3	12.5	19.1	12.8	19.1	12.9	18.8	13.2	18.6	13.5	23
24	20.4	12.7	20.1	13.1	20.0	13.3	19.9	13.4	19.7	13.8	19.4	14.1	24
25	21.2	13.2	21.0	13.6	20.8	13.9	20.7	14.0	20.5	14.3	20.2	14.7	25
26	22.0	13.8	21.8	14.2	21.6	14.4	21.6	14.5	21.3	14.9	21.0	15.3	26
27	22.9	14.3	22.6	14.7	22.4	15.0	22.4	15.1	22.1	15.5	21.8	15.9	27
28	23.7	14.8	23.5	15.2	23.3	15.6	23.2	15.7	22.9	16.1	22.7	16.5	28
29	24.6	15.4	24.3	15.8	24.1	16.1	24.0	16.2	23.8	16.6	23.5	17.0	29
30	25.4	15.9	25.2	16.3	24.9	16.7	24.9	16.8	24.6	17.2	24.3	17.6	30
31	26.3	16.4	26.0	16.9	25.8	17.2	25.7	17.3	25.4	17.8	25.1	18.2	31
32	27.1	17.0	26.8	17.4	26.6	17.8	26.5	17.9	26.2	18.4	25.9	18.8	32
33	28.0	17.5	27.7	18.0	27.4	18.3	27.4	18.5	27.0	18.9	26.7	19.4	33
34	28.8	18.0	28.5	18.5	28.3	18.9	28.2	19.0	27.9	19.5	27.5	20.0	34
35	29.7	18.5	29.4	19.1	29.1	19.4	29.0	19.6	28.7	20.1	28.3	20.6	35
36	30.5	19.1	30.2	19.6	29.9	20.0	29.8	20.1	29.5	20.6	29.1	21.2	36
37	31.4	19.6	31.0	20.1	30.8	20.6	30.7	20.7	30.3	21.2	29.9	21.7	37
38	32.2	20.1	31.9	20.7	31.6	21.1	31.5	21.2	31.1	21.8	30.7	22.3	38
39	33.1	20.7	32.7	21.2	32.4	21.7	32.3	21.8	32.0	22.4	31.6	22.9	39
40	33.9	21.2	33.6	21.8	33.3	22.2	33.2	22.4	32.8	22.9	32.4	23.5	40
41	34.8	21.7	34.4	22.3	34.1	22.8	34.0	22.9	33.6	23.5	33.2	24.1	41
42	35.6	22.3	35.2	22.9	34.9	23.3	34.8	23.5	34.4	24.1	34.0	24.7	42
43	36.5	22.8	36.1	23.4	35.8	23.9	35.6	24.0	35.2	24.7	34.8	25.3	43
44	37.3	23.3	36.9	24.0	36.6	24.4	36.5	24.6	36.0	25.2	35.6	25.9	44
45	38.2	23.8	37.7	24.5	37.4	25.0	37.3	25.2	36.9	25.8	36.4	26.5	45
46	39.0	24.4	38.6	25.1	38.2	25.6	38.1	25.7	37.7	26.4	37.2	27.0	46
47	39.9	24.9	39.4	25.6	39.1	26.1	39.0	26.3	38.5	27.0	38.0	27.6	47
48	40.7	25.4	40.3	26.1	39.9	26.7	39.8	26.8	39.3	27.5	38.8	28.2	48
49	41.6	26.0	41.1	26.7	40.7	27.2	40.6	27.4	40.1	28.1	39.6	28.8	49
50	42.4	26.5	41.9	27.2	41.6	27.8	41.4	28.0	41.0	28.7	40.4	29.4	50
Diff.	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Diff.
	58 Deg.	57 Deg.			5 Points		56 Deg.		55 Deg.		54 Deg.		

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Diff	32 Deg		33 Deg		3 Points		34 Deg		35 Deg		36 Deg		Diff
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
51	43.2	27.0	42.8	27.8	42.4	28.3	42.3	28.5	41.8	29.3	41.3	30.0	51
52	44.1	27.6	43.6	28.3	43.2	28.9	43.1	29.1	42.6	29.8	42.1	30.6	52
53	44.9	28.1	44.5	28.9	44.1	29.4	43.9	29.6	43.4	30.4	42.9	31.2	53
54	45.8	28.6	45.3	29.4	44.9	30.0	44.8	30.2	44.2	31.0	43.7	31.7	54
55	46.6	29.1	46.1	30.0	45.7	30.6	45.6	30.8	45.1	31.5	44.5	32.3	55
56	47.5	29.7	47.0	30.5	46.6	31.1	46.4	31.3	45.9	32.1	45.3	32.9	56
57	48.3	30.2	47.8	31.0	47.4	31.7	47.3	31.9	46.7	32.7	46.1	33.5	57
58	49.2	30.7	48.6	31.6	48.2	32.2	48.1	32.4	47.5	33.3	46.9	34.1	58
59	50.0	31.3	49.5	32.1	49.1	32.8	48.9	33.0	48.3	33.8	47.7	34.7	59
60	50.9	31.8	50.3	32.7	49.9	33.3	49.7	33.6	49.2	34.4	48.5	35.3	60
61	51.7	32.3	51.2	33.2	50.7	33.9	50.6	34.1	50.0	35.0	49.3	35.9	61
62	52.6	32.8	52.0	33.8	51.6	34.4	51.4	34.7	50.8	35.6	50.2	36.4	62
63	53.4	33.4	52.8	34.3	52.4	35.0	52.2	35.2	51.6	36.1	51.0	37.0	63
64	54.3	33.9	53.7	34.9	53.2	35.6	53.1	35.8	52.4	36.7	51.8	37.6	64
65	55.1	34.4	54.5	35.4	54.0	36.1	53.9	36.3	53.2	37.3	52.6	38.2	65
66	56.0	35.0	55.4	35.9	54.9	36.7	54.7	36.9	54.1	37.9	53.4	38.8	66
67	56.8	35.5	56.2	36.5	55.7	37.2	55.5	37.5	54.9	38.4	54.2	39.4	67
68	57.7	36.0	57.0	37.0	56.5	37.8	56.4	38.0	55.7	39.0	55.0	40.0	68
69	58.5	36.6	57.9	37.6	57.4	38.3	57.2	38.6	56.5	39.6	55.8	40.6	69
70	59.4	37.1	58.7	38.1	58.2	38.9	58.0	39.1	57.3	40.2	56.6	41.1	70
71	60.2	37.6	59.5	38.7	59.0	39.4	58.9	39.7	58.2	40.7	57.4	41.7	71
72	61.1	38.2	60.4	39.2	59.9	40.0	59.7	40.3	59.0	41.3	58.2	42.3	72
73	61.9	38.7	61.2	39.8	60.7	40.6	60.5	40.8	59.8	41.9	59.1	42.9	73
74	62.8	39.2	62.1	40.3	61.5	41.1	61.3	41.4	60.6	42.4	59.9	43.5	74
75	63.6	39.7	62.9	40.8	62.4	41.7	62.2	41.9	61.4	43.0	60.7	44.1	75
76	64.4	40.3	63.7	41.4	63.2	42.2	63.0	42.5	62.3	43.6	61.5	44.7	76
77	65.3	40.8	64.6	41.9	64.0	42.8	63.8	43.1	63.1	44.2	62.3	45.3	77
78	66.1	41.3	65.4	42.5	64.9	43.3	64.7	43.6	63.9	44.7	63.1	45.8	78
79	67.0	41.9	66.3	43.0	65.7	43.9	65.5	44.2	64.7	45.3	63.9	46.4	79
80	67.8	42.4	67.1	43.6	66.5	44.4	66.3	44.7	65.5	45.9	64.7	47.0	80
81	68.7	42.9	67.9	44.1	67.4	45.0	67.1	45.3	66.4	46.5	65.5	47.6	81
82	69.5	43.4	68.8	44.7	68.2	45.6	68.0	45.9	67.2	47.0	66.3	48.2	82
83	70.4	44.0	69.6	45.2	69.0	46.1	68.8	46.4	68.0	47.6	67.1	48.8	83
84	71.2	44.5	70.5	45.7	69.8	46.7	69.6	47.0	68.8	48.2	68.0	49.4	84
85	72.1	45.0	71.3	46.3	70.7	47.2	70.5	47.5	69.6	48.8	68.8	50.0	85
86	72.9	45.6	72.1	46.8	71.5	47.8	71.3	48.1	70.5	49.3	69.6	50.5	86
87	73.8	46.1	73.0	47.4	72.3	48.3	72.1	48.6	71.3	49.9	70.4	51.1	87
88	74.6	46.6	73.8	47.9	73.2	48.9	73.0	49.2	72.1	50.5	71.2	51.7	88
89	75.5	47.2	74.6	48.5	74.0	49.4	73.8	49.8	72.9	51.0	72.0	52.3	89
90	76.3	47.7	75.5	49.0	74.8	50.0	74.6	50.3	73.7	51.6	72.8	52.9	90
91	77.2	48.2	76.3	49.6	75.7	50.6	75.4	50.9	74.5	52.2	73.6	53.5	91
92	78.0	48.7	77.2	50.1	76.5	51.1	76.3	51.4	75.4	52.8	74.4	54.1	92
93	78.9	49.3	78.0	50.6	77.3	51.7	77.1	52.0	76.2	53.3	75.2	54.7	93
94	79.7	49.8	78.8	51.2	78.2	52.2	77.9	52.6	77.0	53.9	76.0	55.3	94
95	80.6	50.3	79.7	51.7	79.0	52.8	78.8	53.1	77.8	54.5	76.9	55.8	95
96	81.4	50.9	80.5	52.3	79.8	53.3	79.6	53.7	78.6	55.1	77.7	56.4	96
97	82.3	51.4	81.4	52.8	80.7	53.9	80.4	54.2	79.5	55.6	78.5	57.0	97
98	83.1	51.9	82.2	53.4	81.5	54.4	81.2	54.8	80.3	56.2	79.3	57.6	98
99	84.0	52.5	83.0	53.9	82.3	55.0	82.1	55.4	81.1	56.8	80.1	58.2	99
100	84.8	53.0	83.9	54.5	83.1	55.6	82.9	55.9	81.9	57.4	80.9	58.8	100
Diff	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Diff
	58 Deg	57 Deg		5 Points		56 Deg	55 Deg		54 Deg				

Diff.	34 Point		37 Deg.		38 Deg.		39 D-g.		3½ Point		40 Deg.		Diff.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
1	00.8	00.6	00.8	00.6	00.8	00.6	00.8	00.6	00.8	00.6	00.8	00.6	1
2	01.6	01.2	01.6	01.2	01.6	01.2	01.6	01.3	01.3	01.3	01.5	01.3	2
3	02.4	01.8	02.4	01.8	02.4	01.8	02.3	01.9	02.3	01.9	02.3	01.9	3
4	03.2	02.4	03.2	02.4	03.2	02.3	03.1	02.5	03.1	02.5	03.1	02.6	4
5	04.0	03.0	04.0	03.0	03.9	03.1	03.9	03.1	03.9	03.2	03.8	03.2	5
6	04.8	03.6	04.8	03.6	04.7	03.7	04.7	03.8	04.6	03.8	04.6	03.9	6
7	05.6	04.2	05.6	04.2	05.5	04.3	05.4	04.4	05.4	04.4	05.4	04.5	7
8	06.4	04.8	06.4	04.8	06.3	04.9	06.2	05.0	06.2	05.1	06.1	05.1	8
9	07.2	05.4	07.2	05.4	07.1	05.5	07.0	05.7	07.0	05.7	06.9	05.8	9
10	08.0	06.0	08.0	06.0	07.9	06.2	07.8	06.3	07.7	06.3	07.7	06.4	10
11	08.8	06.6	08.8	06.6	08.7	06.8	08.5	06.9	08.5	07.0	08.4	07.1	11
12	09.6	07.1	09.6	07.2	09.5	07.4	09.3	07.6	09.3	07.6	09.2	07.7	12
13	10.4	07.7	10.4	07.8	10.2	08.0	10.1	08.2	10.0	08.2	10.0	08.4	13
14	11.2	08.3	11.2	08.4	11.0	08.6	10.9	08.8	10.8	08.9	10.7	09.0	14
15	12.0	08.9	12.0	09.0	11.8	09.2	11.7	09.4	11.6	09.5	11.5	09.6	15
16	12.9	09.5	12.8	09.6	12.6	09.9	12.4	10.1	12.4	10.1	12.3	10.3	16
17	13.7	10.1	13.6	10.2	13.4	10.5	13.2	10.7	13.1	10.8	13.0	10.9	17
18	14.5	10.7	14.4	10.8	14.2	11.1	14.0	11.3	13.9	11.4	13.8	11.6	18
19	15.3	11.3	15.2	11.4	15.0	11.7	14.8	12.0	14.7	12.1	14.6	12.2	19
20	16.1	11.9	16.0	12.0	15.8	12.3	15.5	12.6	15.3	12.7	15.3	12.9	20
21	16.9	12.5	16.8	12.6	16.5	12.9	16.3	13.2	16.2	13.3	16.1	13.5	21
22	17.7	13.1	17.6	13.2	17.3	13.5	17.1	13.8	17.0	14.0	16.9	14.1	22
23	18.5	13.7	18.4	13.8	18.1	14.2	17.9	14.5	17.8	14.6	17.6	14.8	23
24	19.3	14.3	19.2	14.4	18.9	14.8	18.6	15.1	18.6	15.2	18.4	15.4	24
25	20.1	14.9	20.0	15.0	19.7	15.4	19.4	15.7	19.3	15.9	19.1	16.1	25
26	20.9	15.5	20.8	15.6	20.5	16.0	20.2	16.4	20.1	16.5	19.9	16.7	26
27	21.7	16.1	21.6	16.2	21.3	16.6	21.0	17.0	20.9	17.1	20.7	17.4	27
28	22.5	16.7	22.4	16.8	22.1	17.2	21.8	17.6	21.6	17.8	21.4	18.0	28
29	23.3	17.3	23.2	17.5	22.9	17.9	22.5	18.2	22.4	18.4	22.2	18.6	29
30	24.1	17.9	24.0	18.1	23.6	18.5	23.3	18.9	23.2	19.0	23.0	19.3	30
31	24.9	18.5	24.8	18.7	24.4	19.1	24.1	19.5	24.0	19.7	23.7	19.9	31
32	25.7	19.1	25.6	19.3	25.2	19.7	24.9	20.1	24.7	20.3	24.5	20.6	32
33	26.5	19.7	26.4	19.9	26.0	20.3	25.6	20.8	25.5	20.9	25.3	21.2	33
34	27.3	20.3	27.2	20.5	26.8	20.9	26.4	21.4	26.3	21.6	26.0	21.9	34
35	28.1	20.8	28.0	21.1	27.6	21.5	27.2	22.0	27.1	22.2	26.8	22.5	35
36	28.9	21.4	28.7	21.7	28.4	22.2	28.0	22.7	27.8	22.8	27.6	23.1	36
37	29.7	22.0	29.5	22.3	29.2	22.8	28.8	23.3	28.6	23.5	28.3	23.8	37
38	30.5	22.6	30.3	22.9	29.9	23.4	29.5	23.9	29.4	24.1	29.1	24.4	38
39	31.3	23.2	31.1	23.5	30.7	24.0	30.3	24.5	30.1	24.7	29.9	25.1	39
40	32.1	23.8	31.9	24.1	31.5	24.6	31.1	25.2	30.9	25.4	30.6	25.7	40
41	32.9	24.4	32.7	24.7	32.3	25.2	31.9	25.8	31.7	26.0	31.4	26.4	41
42	33.7	25.0	33.5	25.3	33.1	25.9	32.6	26.4	32.5	26.6	32.2	27.0	42
43	34.5	25.6	34.3	25.9	33.9	26.5	33.4	27.1	33.2	27.3	32.9	27.6	43
44	35.3	26.2	35.1	26.5	34.7	27.1	34.2	27.7	34.0	27.9	33.7	28.3	44
45	36.1	26.8	35.9	27.1	35.5	27.7	35.0	28.3	34.8	28.5	34.5	28.9	45
46	36.9	27.4	36.7	27.7	36.2	28.3	35.7	28.9	35.6	29.2	35.2	29.6	46
47	37.7	28.0	37.5	28.3	37.0	28.9	36.5	29.6	36.3	29.8	36.0	30.2	47
48	38.5	28.6	38.3	28.9	37.8	29.6	37.3	30.2	37.1	30.5	36.8	30.9	48
49	39.4	29.2	39.1	29.5	38.6	30.2	38.1	30.8	37.9	31.1	37.5	31.5	49
50	40.2	29.8	39.9	30.1	39.4	30.8	38.9	31.5	38.6	31.7	38.3	32.1	50
Diff.	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Diff.
	4½ Point		53 Deg.		52 Deg.		51 Deg.		4½ Point		50 Deg.		

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Diff.	3½ Point		37 Deg.		38 Deg.		39 Deg.		3½ Point		40 Deg.		Diff.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
51	41.0	30.4	40.7	30.7	40.2	31.4	39.6	32.1	39.4	32.4	39.1	32.8	51
52	41.8	31.0	41.5	31.3	41.0	32.0	40.4	32.7	40.2	33.0	39.8	33.4	52
53	42.6	31.6	42.3	31.9	41.8	32.6	41.2	33.4	41.0	33.6	40.6	34.1	53
54	43.4	32.2	43.1	32.5	42.6	33.2	42.0	34.0	41.7	34.3	41.4	34.7	54
55	44.2	32.8	43.9	33.1	43.3	33.9	42.7	34.6	42.5	34.9	42.1	35.4	55
56	45.0	33.4	44.7	33.7	44.1	34.5	43.5	35.2	43.3	35.5	42.9	36.0	56
57	45.8	34.0	45.5	34.3	44.9	35.1	44.3	35.9	44.1	36.2	43.7	36.6	57
58	46.6	34.5	46.3	34.9	45.7	35.7	45.1	36.5	44.8	36.8	44.4	37.3	58
59	47.4	35.1	47.1	35.5	46.5	36.3	45.8	37.1	45.6	37.4	45.2	37.9	59
60	48.2	35.7	47.9	36.1	47.3	36.9	46.6	37.8	46.4	38.1	46.0	38.6	60
61	49.0	36.3	48.7	36.7	48.1	37.6	47.4	38.4	47.2	38.7	46.7	39.2	61
62	49.8	36.9	49.5	37.3	48.9	38.2	48.2	39.0	47.9	39.3	47.3	39.9	62
63	50.6	37.5	50.3	37.9	49.6	38.8	49.0	39.6	48.7	40.0	48.3	40.5	63
64	51.4	38.1	51.1	38.5	50.4	39.4	49.7	40.3	49.5	40.6	49.0	41.1	64
65	52.2	38.7	51.9	39.1	51.2	40.0	50.5	40.9	50.2	41.2	49.8	41.8	65
66	53.0	39.3	52.7	39.7	52.0	40.6	51.3	41.5	51.0	41.9	50.6	42.4	66
67	53.8	39.9	53.5	40.3	52.8	41.3	52.1	42.2	51.8	42.5	51.3	43.1	67
68	54.6	40.5	54.3	40.9	53.6	41.9	52.8	42.8	52.6	43.1	52.1	43.7	68
69	55.4	41.1	55.1	41.5	54.4	42.5	53.6	43.4	53.3	43.8	52.9	44.4	69
70	56.2	41.7	55.9	42.1	55.2	43.1	54.4	44.1	54.1	44.4	53.6	45.0	70
71	57.0	42.3	56.7	42.7	55.9	43.7	55.2	44.7	54.9	45.0	54.4	45.6	71
72	57.8	42.9	57.5	43.3	56.7	44.3	56.0	45.3	55.7	45.7	55.2	46.3	72
73	58.6	43.5	58.3	43.9	57.5	44.9	56.7	45.9	56.4	46.3	55.9	46.9	73
74	59.4	44.1	59.1	44.5	58.3	45.6	57.5	46.6	57.2	46.9	56.7	47.6	74
75	60.2	44.7	59.9	45.1	59.1	46.2	58.3	47.2	58.0	47.6	57.5	48.2	75
76	61.0	45.3	60.7	45.7	59.9	46.8	59.1	47.8	58.7	48.2	58.2	48.9	76
77	61.8	45.9	61.5	46.3	60.7	47.4	59.8	48.5	59.5	48.8	59.0	49.5	77
78	62.6	46.5	62.3	46.9	61.5	48.0	60.6	49.1	60.3	49.5	59.7	50.1	78
79	63.5	47.1	63.1	47.5	62.3	48.6	61.4	49.7	61.1	50.1	60.5	50.8	79
80	64.3	47.7	63.9	48.1	63.0	49.3	62.2	50.3	61.8	50.8	61.3	51.4	80
81	65.1	48.3	64.7	48.7	63.8	49.9	62.9	51.0	62.6	51.4	62.0	52.1	81
82	65.9	48.8	65.5	49.3	64.6	50.5	63.7	51.6	63.4	52.0	62.8	52.7	82
83	66.7	49.4	66.3	49.9	65.4	51.1	64.5	52.2	64.2	52.7	63.6	53.4	83
84	67.5	50.0	67.1	50.6	66.2	51.7	65.3	52.9	64.9	53.3	64.3	54.0	84
85	68.3	50.6	67.9	51.2	67.0	52.3	66.1	53.5	65.7	53.9	65.1	54.6	85
86	69.1	51.2	68.7	51.8	67.8	52.9	66.8	54.1	66.5	54.6	65.9	55.3	86
87	69.9	51.8	69.5	52.4	68.6	53.5	67.6	54.7	67.3	55.2	66.6	55.9	87
88	70.7	52.4	70.3	53.0	69.3	54.2	68.4	55.4	68.0	55.8	67.4	56.6	88
89	71.5	53.0	71.1	53.6	70.1	54.8	69.2	56.0	68.8	56.5	68.2	57.2	89
90	72.3	53.6	71.9	54.2	70.9	55.4	69.9	56.6	69.6	57.1	68.9	57.9	90
91	73.1	54.2	72.7	54.8	71.7	56.0	70.7	57.3	70.3	57.7	69.7	58.3	91
92	73.9	54.8	73.5	55.4	72.5	56.6	71.5	57.9	71.1	58.4	70.5	59.1	92
93	74.7	55.4	74.3	56.0	73.3	57.3	72.3	58.5	71.9	59.0	71.2	59.8	93
94	75.5	56.0	75.1	56.6	74.1	57.9	73.0	59.2	72.7	59.6	72.0	60.4	94
95	76.3	56.6	75.9	57.2	74.9	58.5	73.8	59.8	73.4	60.3	72.8	61.1	95
96	77.1	57.2	76.7	57.8	75.6	59.1	74.6	60.4	74.2	60.9	73.5	61.7	96
97	77.9	57.8	77.5	58.4	76.4	59.7	75.4	61.0	75.0	61.5	74.3	62.4	97
98	78.7	58.4	78.3	59.0	77.2	60.3	76.2	61.7	75.8	62.2	75.1	63.0	98
99	79.5	59.0	79.1	59.6	78.0	61.0	76.9	62.3	76.5	62.8	75.8	63.6	99
100	80.3	59.6	79.9	60.2	78.8	61.6	77.7	62.9	77.3	63.4	76.6	64.3	100
Diff.	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Diff.
	4½ Point	53 Deg.	52 Deg.	51 Deg.	4½ Point	50 Deg.							

A TABLE of DIFFERENCE

Diff	41 Deg.		42 Deg.		3 1/4 Point		43 Deg.		44 Deg.		4 Points		Diff
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
1	00,8	00,7	00,7	00,7	00,7	00,7	00,7	00,7	00,7	00,7	00,7	00,7	1
2	01,5	01,3	01,5	01,3	01,5	01,3	01,5	01,4	01,4	01,4	01,4	01,4	2
3	02,3	02,0	02,2	02,0	02,2	02,0	02,2	02,0	02,2	02,1	02,1	02,1	3
4	03,0	02,6	03,0	02,7	03,0	02,7	03,0	02,7	02,9	02,8	02,8	02,8	4
5	03,8	03,3	03,7	03,3	03,7	03,4	03,7	03,4	03,6	03,5	03,5	03,5	5
6	04,5	03,9	04,5	04,0	04,4	04,0	04,4	04,1	04,3	04,2	04,2	04,2	6
7	05,3	04,6	05,2	04,7	05,2	04,7	05,1	04,8	05,0	04,9	04,9	04,9	7
8	06,0	05,2	05,9	05,4	05,9	05,4	05,9	05,5	05,8	05,6	05,7	05,7	8
9	06,8	05,9	06,7	06,0	06,7	06,0	06,6	06,1	06,5	06,3	06,4	06,4	9
10	07,5	06,6	07,4	06,7	07,4	06,7	07,3	06,8	07,2	06,9	07,1	07,1	10
11	08,3	07,2	08,2	07,4	08,2	07,4	08,0	07,5	07,9	07,6	07,8	07,8	11
12	09,1	07,9	08,9	08,0	08,9	08,1	08,8	08,2	08,6	08,3	08,5	08,5	12
13	09,8	08,5	09,7	08,7	09,6	08,7	09,5	08,9	09,3	09,0	09,2	09,2	13
14	10,6	09,2	10,4	09,4	10,4	09,4	10,2	09,5	10,1	09,7	09,9	09,9	14
15	11,3	09,8	11,1	10,0	11,1	10,1	11,0	10,2	10,8	10,4	10,6	10,6	15
16	12,1	10,5	11,9	10,7	11,9	10,7	11,7	10,9	11,5	11,1	11,3	11,3	16
17	12,8	11,2	12,6	11,4	12,6	11,4	12,4	11,6	12,2	11,8	12,0	12,0	17
18	13,6	11,8	13,4	12,0	13,3	12,1	13,2	12,3	12,9	12,5	12,7	12,7	18
19	14,3	12,5	14,1	12,7	14,1	12,8	13,9	13,0	13,7	13,2	13,4	13,4	19
20	15,1	13,1	14,9	13,4	14,8	13,4	14,6	13,6	14,4	13,9	14,1	14,1	20
21	15,8	13,8	15,6	14,0	15,6	14,1	15,1	14,3	15,1	14,6	14,8	14,8	21
22	16,6	14,4	16,3	14,7	16,3	14,8	16,2	15,0	15,8	15,3	15,6	15,6	22
23	17,4	15,1	17,1	15,4	17,0	15,4	16,8	15,7	16,5	16,0	16,3	16,3	23
24	18,1	15,7	17,8	16,1	17,8	16,1	17,6	16,4	17,3	16,7	17,0	17,0	24
25	18,9	16,4	18,6	16,8	18,5	16,8	18,3	17,1	18,0	17,4	17,7	17,7	25
26	19,6	17,1	19,3	17,4	19,3	17,5	19,0	17,7	18,7	18,1	18,4	18,4	26
27	20,4	17,7	20,1	18,1	20,0	18,1	19,7	18,4	19,4	18,8	19,1	19,1	27
28	21,1	18,4	20,8	18,7	20,7	18,8	20,5	19,1	20,1	19,5	19,8	19,8	28
29	21,9	19,0	21,5	19,4	21,5	19,5	21,2	19,8	20,9	20,1	20,5	20,5	29
30	22,6	19,7	22,3	20,1	22,2	20,1	21,9	20,5	21,6	20,8	21,2	21,2	30
31	23,4	20,3	23,0	20,7	23,0	20,8	22,7	21,1	22,3	21,5	21,9	21,9	31
32	24,1	21,0	23,8	21,4	23,7	21,5	23,4	21,8	23,0	22,2	22,6	22,6	32
33	24,9	21,7	24,5	22,1	24,5	22,2	24,1	22,5	23,7	22,9	23,3	23,3	33
34	25,7	22,3	25,3	22,7	25,2	22,8	24,9	23,2	24,5	23,6	24,0	24,0	34
35	26,4	23,0	26,0	23,4	25,9	23,5	25,6	23,9	25,2	24,3	24,7	24,7	35
36	27,2	23,6	26,8	24,1	26,7	24,2	26,3	24,6	25,9	25,0	25,5	25,5	36
37	27,9	24,3	27,5	24,8	27,4	24,8	27,0	25,2	26,6	25,7	26,2	26,2	37
38	28,7	24,9	28,2	25,4	28,2	25,5	27,8	25,9	27,3	26,4	26,9	26,9	38
39	29,4	25,6	29,0	26,1	28,9	26,2	28,5	26,6	28,1	27,1	27,6	27,6	39
40	30,2	26,2	29,7	26,8	29,6	26,9	29,3	27,3	28,8	27,8	28,3	28,3	40
41	30,9	26,9	30,5	27,4	30,4	27,5	30,0	28,0	29,5	28,5	29,0	29,0	41
42	31,7	27,6	31,2	28,1	31,1	28,2	30,7	28,6	30,2	29,2	29,7	29,7	42
43	32,5	28,2	32,0	28,8	31,8	28,9	31,4	29,3	30,9	29,9	30,4	30,4	43
44	33,2	28,9	32,7	29,4	32,6	29,5	32,2	30,0	31,6	30,6	31,1	31,1	44
45	34,0	29,5	33,4	30,1	33,3	30,2	32,9	30,7	32,4	31,3	31,8	31,8	45
46	34,7	30,2	34,2	30,8	34,1	30,9	33,6	31,4	33,1	32,0	32,5	32,5	46
47	35,5	30,8	34,9	31,4	34,8	31,6	34,4	32,1	33,8	32,6	33,2	33,2	47
48	36,2	31,5	35,7	32,1	35,6	32,2	35,1	32,7	34,5	33,3	33,9	33,9	48
49	37,0	32,1	36,4	32,8	36,3	32,9	35,8	33,4	35,2	34,0	34,6	34,6	49
50	37,7	32,8	37,2	33,5	37,0	33,6	36,6	34,1	36,0	34,7	35,4	35,4	50
Diff	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Diff
	49 Deg.		48 Deg.		4 1/4 Point		47 Deg.		46 Deg.		4 Points		

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Diff	41 Deg.		42 Deg.		3 $\frac{3}{4}$ Point		43 Deg.		44 Deg.		4 Points		Diff
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
51	38.5	33.	37.9	34.1	37.8	34.3	37.3	34.8	36.7	35.4	36.1	36.1	51
52	39.2	34.	38.6	34.8	38.5	34.9	38.0	35.5	37.4	36.1	36.8	36.8	52
53	40.0	34.8	39.4	35.5	39.3	35.6	38.8	36.1	38.1	36.8	37.5	37.5	53
54	40.8	35.4	40.1	36.1	40.0	36.3	39.5	37.8	38.8	37.5	38.2	38.2	54
55	41.5	36.1	40.9	36.8	40.8	36.9	40.2	37.5	39.6	38.2	38.9	38.9	55
56	42.3	36.7	41.6	37.5	41.5	37.6	41.0	38.2	40.3	38.9	39.6	39.6	56
57	43.0	37.4	42.4	38.1	42.2	38.3	41.7	38.9	41.0	39.6	40.3	40.3	57
58	43.8	38.1	43.1	38.8	43.0	39.0	42.4	39.6	41.7	40.3	41.0	41.0	58
59	44.5	38.7	43.8	39.5	43.7	39.6	43.2	40.2	42.4	41.0	41.7	41.7	59
60	45.3	39.4	44.6	40.1	44.5	40.3	43.9	40.9	43.2	41.7	42.4	42.4	60
61	46.0	40.0	45.3	40.8	45.2	41.0	44.6	41.6	43.9	42.4	43.1	43.1	61
62	46.8	40.7	46.1	41.5	45.9	41.6	45.3	42.3	44.6	43.1	43.8	43.8	62
63	47.5	41.3	46.8	42.2	46.7	42.3	46.1	43.0	45.3	43.8	44.5	44.5	63
64	48.3	42.0	47.6	42.8	47.4	43.0	46.8	43.6	46.0	44.5	45.3	45.3	64
65	49.1	42.6	48.3	43.5	48.2	43.7	47.5	44.3	46.8	45.2	46.0	46.0	65
66	49.8	43.3	49.0	44.2	48.9	44.3	48.3	45.0	47.5	45.8	46.7	46.7	66
67	50.6	44.0	49.8	44.8	49.6	45.0	49.0	45.7	48.2	46.5	47.4	47.4	67
68	51.3	44.6	50.5	45.5	50.4	45.7	49.7	46.4	48.9	47.2	48.1	48.1	68
69	52.1	45.3	51.3	46.2	51.1	46.3	50.5	47.1	49.6	47.9	48.8	48.8	69
70	52.8	45.9	52.0	46.8	51.9	47.0	51.2	47.7	50.4	48.6	49.5	49.5	70
71	53.6	46.6	52.8	47.5	52.6	47.7	51.9	48.4	51.1	49.3	50.2	50.2	71
72	54.3	47.2	53.5	48.2	53.4	48.4	52.7	49.1	51.8	50.0	50.9	50.9	72
73	55.1	47.9	54.2	48.8	54.1	49.0	53.4	49.8	52.5	50.7	51.6	51.6	73
74	55.8	48.6	55.0	49.5	54.8	49.7	54.1	50.5	53.2	51.4	52.3	52.3	74
75	56.6	49.2	55.7	50.2	55.6	50.4	54.9	51.1	53.9	52.1	53.0	53.0	75
76	57.4	49.9	56.5	50.9	56.3	51.0	55.6	51.8	54.7	52.8	53.7	53.7	76
77	58.1	50.5	57.2	51.5	57.1	51.7	56.3	52.5	55.4	53.5	54.4	54.4	77
78	58.9	51.2	58.0	52.2	57.8	52.4	57.0	53.2	56.1	54.2	55.2	55.2	78
79	59.6	51.8	58.7	52.9	58.5	53.1	57.8	53.9	56.8	54.9	55.9	55.9	79
80	60.4	52.5	59.4	53.5	59.3	53.7	58.5	54.6	57.5	55.6	56.6	56.6	80
81	61.1	53.1	60.2	54.2	60.0	54.4	59.2	55.2	58.3	56.3	57.3	57.3	81
82	61.9	53.8	60.9	54.9	60.8	55.1	60.0	55.9	59.0	57.0	58.0	58.0	82
83	62.6	54.5	61.7	55.5	61.5	55.7	60.7	56.6	59.7	57.7	58.7	58.7	83
84	63.4	55.1	62.4	56.2	62.2	56.4	61.4	57.3	60.4	58.4	59.4	59.4	84
85	64.1	55.8	63.2	56.9	63.0	57.1	62.2	58.0	61.1	59.0	60.1	60.1	85
86	64.9	56.4	63.9	57.5	63.7	57.8	62.9	58.7	61.9	59.7	60.8	60.8	86
87	65.7	57.1	64.6	58.2	64.5	58.4	63.6	59.3	62.6	60.4	61.5	61.5	87
88	66.4	57.7	65.4	58.9	65.2	59.1	64.4	60.0	63.3	61.1	62.2	62.2	88
89	67.2	58.4	66.1	59.6	65.9	59.8	65.1	60.7	64.0	61.8	62.9	62.9	89
90	67.9	59.0	66.9	60.2	66.7	60.4	65.8	61.4	64.7	62.5	63.6	63.6	90
91	68.7	59.7	67.6	60.9	67.4	61.1	66.6	62.1	65.5	63.2	64.3	64.3	91
92	69.4	50.4	68.4	61.6	68.2	61.8	67.3	62.7	66.2	63.9	65.1	65.1	92
93	70.2	61.0	69.1	62.2	68.9	62.5	68.0	63.4	66.9	64.6	65.8	65.8	93
94	70.9	61.7	69.9	62.9	69.7	63.1	68.8	64.1	67.6	65.3	66.5	66.5	94
95	71.7	62.3	70.6	63.6	70.4	63.8	69.5	64.8	68.3	66.0	67.2	67.2	95
96	72.5	63.0	71.3	64.2	71.1	64.5	70.2	65.5	69.1	66.7	67.9	67.9	96
97	73.2	63.6	72.1	64.9	71.9	65.1	70.9	66.2	69.8	67.4	68.6	68.6	97
98	74.0	64.3	72.8	65.6	72.6	65.8	71.7	66.8	70.5	68.1	69.3	69.3	98
99	74.7	65.0	73.6	66.2	73.4	66.5	72.4	67.5	71.2	68.8	70.0	70.0	99
100	75.5	65.6	74.3	66.9	74.1	67.2	73.1	68.2	71.9	69.5	70.7	70.7	100
Diff	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Diff
	49 Deg.		48 Deg.		4 $\frac{1}{2}$ Point		47 Deg.		46 Deg.		4 Points		

The Use and Explanation of the Table of Difference of Latitude and Departure.

THIS is a Table larger and better contriv'd than any of this Nature yet extant, it gives the Difference of Latitude and Departure in Minutes and Tenths, to any Distance not exceeding 100 Miles, and to every Degree and Quarter Point of the Compass; and may be used to a greater Distance being taken out at twice or thrice, according to the Quantity of the Distance, as shall be shewn in the Use.

The Course stands at the Head and Foot of the Table, to every Degree and Quarter Point of the Compass; at the Head it begins at 1 deg. so 2 deg. $\frac{1}{4}$ Point, &c. encreasing to 45 deg. or 4 Points. At the Foot it begins at 45 deg. or 4 Points, so 46 deg. 47 deg. $4\frac{1}{4}$ Points, &c. encreasing backwards to 90 deg. or 8 Points. The Distance stands in the two outmost Columns under the Title *Dist.* which on the Left-hand Page begins at 1 and runs to 50; on the Right-hand Page it begins at 51, and runs to 100, the Difference of Latitude and Departure stands under the Course at the Head, and over it at the Foot of the Table.

The Use of the TABLE.

This Table is very useful in Navigation, especially in working a *Traverse*.

Example 1. The Course and Distance given, to find the Difference of Latitude and Departure by the Table.

Suppose a Ship sails NNE. 3 quarters E. 95 Miles, the Difference of Latitude and Departure are required.

On the Right-hand Page (because the Distance is above 50) and at the Top (because it is less than 4 Points) look for $2\frac{1}{4}$ Points, which is the Course; under which, and against 95 the Distance, and under the Title *Lat.* stands 81.5, which is 81 min. $\frac{5}{10}$ the Difference of Latitude, and under the Title *Dep.* stands 48.8, which is 48 min. $\frac{8}{10}$ the Departure required?

Example 2. Suppose a Ship sails South 56 deg. Westerly 48 Miles, the Difference of Latitude and Departure required?

On the Left-hand Page (because the Distance is less than 50) and at the Bottom (because it is more than 45d.) look for 56d. the Course; over which, and against 48 the Distance, over the Title *Lat.* stands 26.8, that is 26 min. $\frac{8}{10}$ the Difference of Latitude; and over the Title *Dep.* stands 39.8, that is 39 min. $\frac{8}{10}$ the Departure required?

Example 3. Suppose a Ship sails North West by North 160 Miles, the Difference of Latitude and Departure are required by the Table?

On the Right-hand Page at the Top, look for 3 Points the Course. Now because the Table goes to but 100, take for 100 first; therefore under 3 Points, and against 100, under the Title *Lat.* stands 83.1, that is 83 min. $\frac{1}{10}$ the Difference of Latitude; and under the Title *Dep.* stands 55.6

that

that is 55 min. 6 tenths the Departure; then for 60 under 3 Points, against 60 under the Title *Lat.* stands 49.9, that is 49 min. 9 tenths the Difference of Latitude, and under the Title *Dep.* stands 33.3 that is 33 min. 3 tenths the Departure, then add the Difference of Latitude and Departure for 60, to the Difference of Latitude and Departure for 100, the Sum is 133 min. the Difference of Latitude, and 88.9 tenths, the Departure required.

This Table is also useful in the Resolution of the rest of the Problems of *Plane Sailing*, which for Brevity-sake are omitted here, being taught at large in the last Edition of *Practical Navigation*; but the general Use of it is in the exact Working of a Traverse.

Example 1. Suppose a Ship bound to a certain Port, sails S. E. by S. 49 min. then ESE. half E. 52 min. then E. by N. half E. 62 min. then SSW. half W. 57 min, then S. half E. 39 min. to find the Difference of Latitude and Departure the Ship hath made.

Set down the several Courses and Distances, first allowing for Lee-way, if any; then proceed to look out the Difference of Latitude and Departure for each Course and Distance (by the Directions before given) in the Table, placing them in their proper Columns, (*viz.*) If the Course be Northerly, the Difference of Latitude must be put in the North Column; if Southerly in the South Column; if the Departure be Easterly it must be put in the East Column; if Westerly in the West Column, as was before directed: Then having framed the Table, add up the Columns of Difference of Latitude and Departure, and subtract the lesser Difference of Latitude and Departure from the greater, the Remainder is the general Difference of Latitude and Departure.

The TABLE.

Courses.	Distances.	Diff. of Lat.		Departure	
		North	South	East	West
S. E. by S.	49		40.7	27.2	
ESE. half E.	52		15.1	49.7	
E. by N. $\frac{1}{2}$ E.	62	06.1		61.7	
S.S.W. $\frac{1}{2}$ W.	57		50.3		26.9
S. half E.	39		38.8	03.8	
		06.1	144.9	142.4	26.9
			06.1	26.9	
			138.8	115.5	

The general Diff. of Lat. is 138.8 tenths S. the Dep. 115.5 tenths E. then to find the Course and Distance, find the Lat. and Dep. in their proper Columns, but the Tables not extending so far, I take half of each, *viz.* half the Diff. of Lat. 69.4. and half the Dep. 57.7, the nearest to which, in the Columns of Lat. and Dep. in the Traverse Table is 69.6 and 57.1, over which at the Top I find $3\frac{1}{4}$ Point for the Course South Easterly, or South East half South, and in the Co-

lumn of Dist. 90, which doubled (because I took half the two Numbers) is 180 the Distance required.

Example

Example 2. The Course given in Degrees, which often happens, by reason of Allowance for the Variation of the Compass, and in the like Cases.

Suppose a Ship bound to a certain Port, sails 65 Miles North, 34 deg. Westerly. Then 56 Miles North, 67 deg. Westerly. Then 48 Miles South 78 deg. Westerly. Then 54 Miles North, 23 deg. Easterly. Then 36 Miles North, 6 deg. Easterly, the Difference of Latitude and Departure are required?

Courses.		Distances	Diff. of Latitude		Departure	
			North.	South	East	West
NW	34°	65	53.9			36.3
NW	67°	56	21.9			51.5
SW	78°	48		10.0		47.0
NE	23°	54	49.7		21.1	
NE	6°	36	35.8		03.8	
			161.3	10.0	24.9	134.8
			10.0			24.9
			151.3			109.9

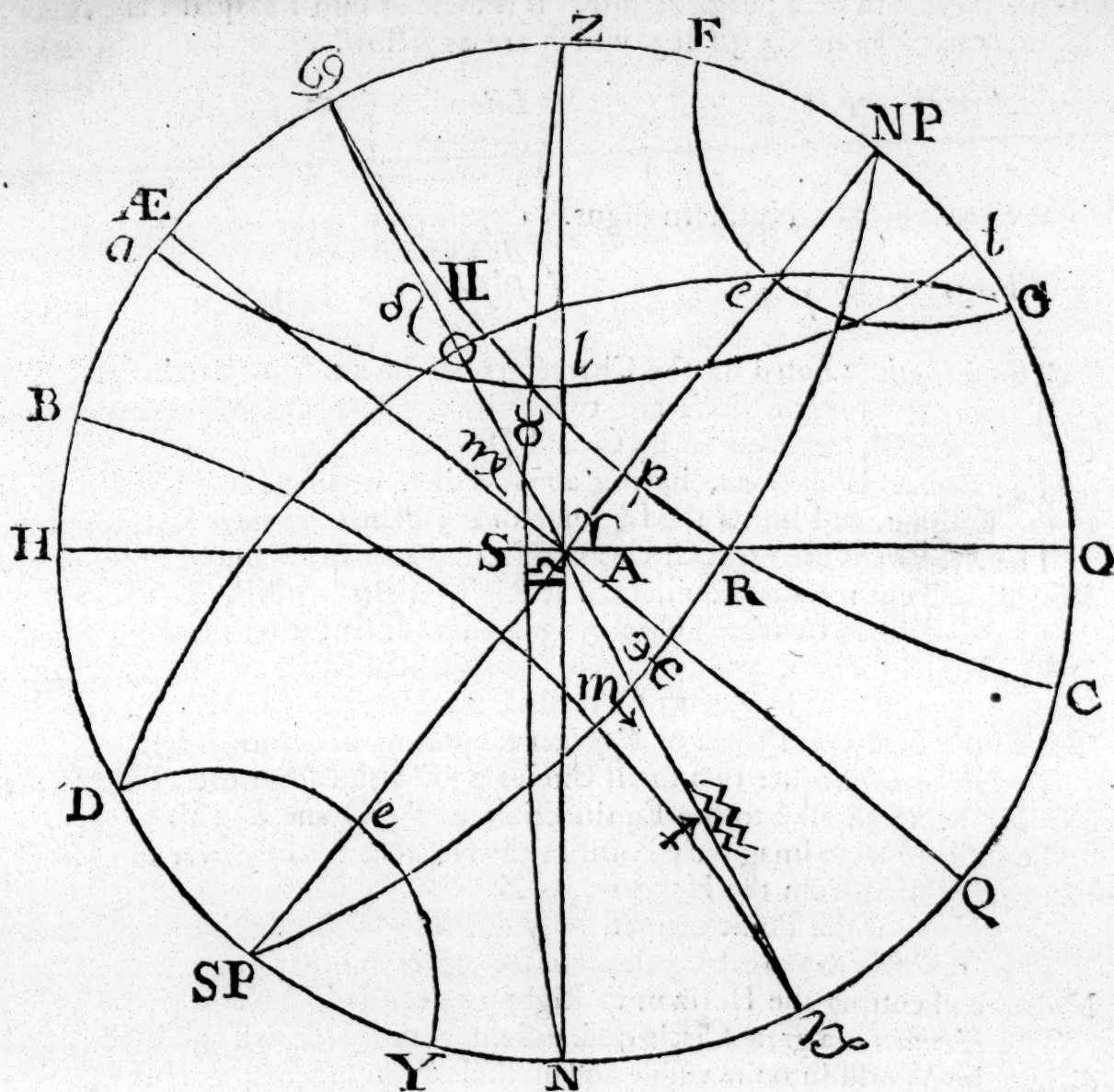
The general Difference of Latitude is 151.3 North, the Departure 109.9 West. The Course and Distance is found as in the last Example.

But if you would keep a Reckoning both in Latitude and Longitude, you may also find the Difference of Longitude by the *Traverse Table*, (according to *Middle Latitude Sailing*) thus, find the Complement of Middle Latitude in the Degrees, at the Top or Bottom of the Table, and under or above that in the Column of Departure, find your Departure, and right against that in the Column of Distance, you have the Difference of Longitude; if your Departure is too large for the Table, take one-half or one-third thereof, and proceed as before.

Example. Suppose in the last Instance of a *Traverse*, the Ship hath sailed from Latitude 50 deg. 00 min. North, then because the Difference of Latitude is 151 min. or 2 deg. 31 min. the Latitude come to is 52 deg. 31 min. and consequently the Middle Latitude is 51 deg. 16 min. it's Complement 38 deg. 44 min. which being nearest 39 deg. I look for 39 at the Head of the Table, and under it in the Column of Dep. I look for the Departure 110, but the Table not proceeding so far, I take its half, viz. 55, the nearest to which in the Table, is, 54.7 (being less) against which, in the Column of Distance is 87, which doubled (because I took half the Departure) the Sum 174 min. or 2d. 54 min. is the Difference

of

Longitude required, which is sufficiently exact for common Practice, only I would advise all Persons for avoiding as much as possible any Error, that every Time the Reckoning is corrected by an Observation, the Longitude be also corrected according to *Mercator's Sailing*, as you are taught in the last Edition of *Practical Navigation*.



Some necessary Astronomic Definitions.

THE Poles of the Equinoctial (commonly called the Poles of the World) are two fixed Points in the Heavens, opposite one to the other; the one visible to us, called the North Pole, marked with the Letters N. P; the other not visible to us, called the South Pole, marked with S. P.

The *Axis* of the World is a Line imagined to pass from Pole to Pole, about which is performed the diurnal Revolution, as the Line, NP, A, SP.

P

The

The *Equinoctial* is a great Circle 90 deg. distant from the Poles of the World, and divides the Globe into the North and South Hemispheres; it is noted by the Letters *Æ A Q*.

The *Ecliptic* is a great Circle intersecting the Equinoctial in two opposite Points, the beginning of *Aries*, and the beginning of *Libra*, and makes an Angle therewith of 23 deg. 29 min. It is divided into 12 equal Parts, called Signs, each containing 30 deg. which are as follow.

<i>Aries</i>	♈	} called Northern Signs.	<i>Libra</i>	♎	} called Southern Signs.
<i>Taurus</i>	♉		<i>Scorpio</i>	♏	
<i>Gemini</i>	♊		<i>Sagittarius</i>	♐	
<i>Cancer</i>	♋		<i>Capricornus</i>	♑	
<i>Leo</i>	♌		<i>Aquarius</i>	♒	
<i>Virgo</i>	♍		<i>Pisces</i>	♓	

The *Ecliptic* is noted by the Characters of the 12 Signs as above.

The Poles of the *Ecliptic* are two Points 23d. 29m. from the Poles of the Equinoctial, represented by G and D.

The *Zodiac* is a Zone, having about 8 deg. in Breadth on either Side of the Ecliptic, and limits the Latitude of the Planets in their Revolutions.

The *Meridians* are great Circles intersecting each other in the Poles of the World, and cutting the Equinoctial at Right-angles, as NP, R, SP.

The *Tropics* are two small Circles 23d. 29m. distant from the Equinoctial, being parallel thereto, and limit the Sun's greatest Declination; the North Tropic being marked with ♋ C, called the Tropic of *Cancer*, the South Tropic is called the Tropic of *Capricorn*, and marked with ♑ B.

The *Polar Circles* are two small Circles 23d. 29m. from each Pole of the World, being parallel to the Equinoctial, as F e G and D e Y.

The *Zenith* is an imaginary Point in the Heavens directly over our Heads, viz. 90d. distant from the Horizon, as Z.

The *Nadir* is the Point diametrically opposite to the Zenith, as N.

The *Azimuths* are great Circles intersecting each other in the Zenith and Nadir, and cutting the Horizon at Right-angles, as Z S N.

The *Horizon* is a great Circle 90d. distant from the Zenith and Nadir, and divides the World into the visible and invisible Hemispheres, as H A O.

The *Meridian* of a Place, is that Meridian that passeth by the Zenith and the Nadir, of the said Place, and is represented by the Circle ZNPOQNSPHÆZ.

Parallels of Altitude or *Almicanters*, are small Circles parallel to the Horizon; imagined to pass through any Degree of Altitude, between the Horizon and the Zenith, as *alt*.

Parallels of Declination or *Latitude*, are small Circles parallel to the Equinoctial, and are called *Parallels of Declination*, with respect to the Heavens, and *Parallels of Latitude* respecting the Earth, as ☉ p R C.

Circles

Circles of the Longitude in the Heavens, are great Circles intersecting each other in the Poles of the Ecliptic, and cutting the Ecliptic at right Angles, as G, O, D.

Parallels of Latitude in the Heavens, are small Circles parallel to the Ecliptic.

The *Latitude* of a Star is an Arch of a Circle of Longitude contained between the Center of the Star and the Ecliptic, and is accounted either Northerly or Southerly,

The *Longitude* of a Star is an Arch of the Ecliptic, intercepted between a Circle of Longitude passing by the Star, and the beginning of *Aries*, and is accounted according to the Order of the Signs.

The *Declination* of the Sun or Star is an Arch of the Meridian contained between the Center of the Sun or Star, and the Equinoctial, and is accounted either Northerly or Southerly.

The *Right Ascension* is that Degree and Minute of the Equinoctial that comes to the Meridian with the Center of the Sun or Star.

Oblique Ascension is the Degree and Minute of the Equinoctial that riseth with the Center of the Sun or Star, in an Oblique Sphere.

Oblique Descension is the Degree and Minute of the Equinoctial that sets with the Center of the Sun or Star, in an Oblique Sphere.

Ascensional Difference is an Arch of the Equinoctial, contained between the Right and Oblique Descension or Ascension, or it is the Difference of the Time between the Sun-rising or setting, and six o'Clock.

The *Amplitude* is an Arch of the Horizon, being the Distance of the Rising or Setting of the Sun or Star from the East or West, and is accounted either Northerly or Southerly.

The *Latitude* of a Place is the Height of the Pole above the Horizon, or the Distance between the Zenith and the Equinoctial.

Longitude on the Earth, is an Arch of the Equator contained between the Meridian of the Place where the Longitude is assigned to begin, and the Meridian of any other Place, and is accounted either Easterly or Westerly.

Astronomic Problems useful in NAVIGATION.

PROBLEM I.

THE Sun's Place and greatest Declination given, to find it's present Declination.

Example.

Suppose the Sun's Place to be 20d. 30m. in *Gemini*, the greatest Declination is 23d. 29m. it is required to find the present Declination.

The Operation by the Logarithms.

As Radius	_____	10.000000
Is to S. Sun's greatest Declination 23d. 29m.	_____	9.600409
So is S. Sun's Longitude 80d. 30m. from <i>Aries</i>	_____	9.994003
To S. Sun's present Declination 23d. 09m. North	_____	19.594412
P 2		By

By Gunter.

The Extent from Radius S. 90d. to S. 23d. 29m. will reach from S. 80d. 30m. to the S. 23d. 9m. the Sun's Declin. N. because in a Northern Sign.

Note, The Sun's Longitude is reckoned from the next Equinoctial Point; therefore if the Sun be in *Aries*, *Taurus*, *Gemini*, *Capricornus*, *Aquarius* or *Pisces*, the Longitude is accounted from *Aries*, but if in *Cancer*, *Leo*, *Virgo*, *Libra*, *Scorpio*, *Sagittarius*, it is accounted from *Libra*.

Aries, *Taurus*, *Gemini*, *Cancer*, *Leo*, *Virgo*, are called Northern Signs, *Libra*, *Scorpio*, *Sagittarius*, *Capricornus*, *Aquarius* and *Pisces*, are called Southern Signs. Consequently, if the Sun's Place be in any of the first six Signs, the Declination is North; but if in any of the latter six, the Declination is South.

P R O B. II.

The Sun's greatest Declin. and present Declin. given, to find his Place.

The Sun's greatest Declination is 23d. 29m. and present Declination is 18d. 30m. North increasing, the Sun's Place required?

By the Logarithms.

As the S. of the Sun's greatest Declination 23d. 29m. ———	9.600409
To the Radius ———	10.000000
So is the Sine of the present Declination 18d. 30m. North ———	9.501476
To the Sine of the Sun's Longitude 52d. 46m. ———	9.901067

That is one Sign (30d. making a Sign) and 22d. 46m. from *Aries*, because the Declination is North and increasing, that is 22d. 46m. of *Taurus*; but if the Declination had been North decreasing, it must have been accounted from *Libra*, and then it would have been 7d. 14m. in *Leo*.

By Gunter.

The Extent of the Compasses from the Sine 23d. 29m. the greatest Declination to Radius, S. 90d. will reach from S. 18d. 30m. the Sun's present Declination, to 52d. 46m. the Sun's Longitude as above.

P R O B. III.

The Sun's Place and greatest Declination given to find the Right Ascension.

Example.

The Sun's Place 10d. 30m. in *Aquarius*, the Right Ascension is required.

The Operation by the Logarithms.

As Radius ———	10.000000
To the Tangent of the Sun's Longitude from <i>Aries</i> 49d. 30m. ———	10.068501
So is the S.c. of the greatest Declination 23d. 29m. ———	9.962453
To the Tangent of the Sun's Right Ascension 47d. 2m. ———	10.030954

By Gunter.

The Extent from Radius S. 90d. to S.c. of the greatest Declination 66d. 41m. will reach from Tangent Sun's Longitude from *Aries* 49d. 30m. to the Tangent of the Right Ascension 47d. 02m. required.

Note,

Note. This Proportion gives the Sun's Right Ascension from the next Equinoctial Point; but it ought to be accounted from *Aries* according to the Order and Succession of the Signs, and therefore in this Case 47d. 2m. subtracted from 360d. (because the Sun is in the 4th Quarter of the Ecliptic, or South decreasing) gives 312d. 58m. the Right Ascension from *Aries*.

P R O B. IV.

The Latitude of a Place, and the Sun's Declination given, to find the Sun's Amplitude.

Example.

The Latitude 51d. 32m. North, and the Sun's Declination 15d. 20m. North, what is the Amplitude?

The Operation by the Logarithms.

As S.c. of the Latitude 51d. 32m.	—————	9.793832
To Radius	—————	10.000000
So is the S. of the Declination 15d. 20m. North	—————	9.422318
To the S. of the Sun's Amplitude 25d. 9m.	—————	9.628486

By Gunter.

The Extent from the S. c. of the Latitude 38d. 28m. to the Sine of the Declination 15d. 20m. North, will reach from Radius S. 90d. to S. 25d. 9m. the Sun's Amplitude North, as above.

Note. If the Declination be North, the Amplitude is North, and if the Declination be South, the Amplitude is also South.

P R O B. V.

The Latitude of a Place, and the Sun's Declination given, to find the Ascensional Difference.

Example.

Suppose in the Latitude 51d. 32m. North, the Sun's Declination is 10d. 45m. North, and the Ascensional Difference required.

The Operation by the Logarithms.

As Tangent Complement of the Latitude 51d. 32m.	—————	9.900086
To Radius	—————	10.000000
So is the Tangent of the Sun's Declination 10d. 45m.	—————	9.278424
To the Sine of the Ascensional Difference 13d. 49m.	—————	9.378338

By Gunter.

The Extent from Tangent 38d. 28m. (the Complement of Latitude) to Tangent 10d. 45m. the Sun's Declination; will reach from Radius S. 90d. to S. 13d. 49m. the Sun's Ascensional Difference as above.

P R O B.

PROB. VI.

To find the Oblique Ascension and Descension.

First, Find the Aicensional Difference by the Fifth Problem.

Secondly, The Right Ascension by the Third Problem.

When the Latitude and Sun's Declination are both North or both South, the Ascensional Difference subtracted from the Right Ascension, gives the Oblique Ascension, and added thereto, gives the Oblique Descension; but when one is North and the other South, the Ascensional Difference added to the Right Ascension, gives the Oblique Ascension, and subtracted gives the Oblique Descension.

Note, That if the Ascensional Difference exceed the Right Ascension, add to the Right Ascension 360 Degrees, then subtract the Ascensional Difference therefrom.

Or, if both being added together exceed 360 Degrees, the Excess is the Oblique Ascension or Descension.

PROB. VII.

To find the Time of the Sun's Rising and Setting, and Length of the Day or Night.

Find the Ascensional Difference by the Fifth Problem, which convert into Hours and Minutes of Time, accounting for 15 Degrees of the Equinoctial one Hour, and for every Degree 4 Minutes of Time, and for every 15 Minutes of the Equinoctial 1 Minute of Time.

1. If the Latitude and Sun's Declination are both North or both South, the Ascensional Difference added to six Hours, gives the Time of Sun-setting; and subtracted is the Time of Sun-rising.

2. But if one be North and the other South, then the Ascensional Difference added, gives the Time of Sun-rising; and subtracted is the Time of setting.

The Time of Sun-setting doubled, gives the Length of the Day; the Time of Sun-rising doubled, is the Length of the Night.

Example.

In Latitude 51d. 32m. North, suppose the Sun's Declination 21d. 57m. North, the Ascensional Difference is 30d. 29m. which reduced in Time is

H M.S.

2 01 56

6 00 00

Sun setteth—8 01 56

Sun rise:h — 3 58 04

H. M. S.

(16 03 52)

{ 07 56 08 }

doubled is $\left\{ \begin{matrix} 16 & 03 & 52 \\ 07 & 56 & 08 \end{matrix} \right\}$ length of the $\left\{ \begin{matrix} \text{Day.} \\ \text{Night.} \end{matrix} \right.$

P R O B.

P R O B. VIII.

The Latitude of a Place, the Sun's Altitude and Declination given, to find the Azimuth.

The R U L E.

Take the Complement of the Altitude, the Compl. of the Latitude, and the Compl. of the Declination, add them together, and take the half Sum; subtract the Compl. of the Declination from the half Sum, and take the Remainder; then set down the Compl. Arithmetical of the Sines of the Compl. Altitude, and Compl. Latitude, and thereto add the Sines of the half Sum and Remainder; half the Sum of these four Logarithms is the S.c. of half the Azimuth required.

Note, If the Declination be South in North Latitude, or North in South Latitude, instead of taking the Complement of the Declination to 90d. you must add 90 Degrees thereto, and then proceed as before.

Example I.

In the Latitude 51d. 32m. North, the Sun's Declination is 20d. 30m. North, his Altitude 47d. 30m. and his Azimuth from the North required.

The Operation by the Logarithms.

d.	m.				
42	: 30	Compl. Altitude A.M.	————	S. Co. Ar.	— 0.170317
38	: 28	Compl. Latitude North	————	S. Co. Ar.	— 0.206168
69	: 30	Compl. Declination N. or Sun's Distance from the Pole.			
150	: 28	Sum			
75	: 14	Half Sum	————	S.	— 9.985414
5	: 44	Excess of the Half Sum above c. Decl.		S.	— 8.999559
					Sum 19.361458
61d.	: 21m.	————	Sc.	————	Half Sum 9.680729
61d.	: 21m.				

doubled 122d. : 42m. the Sun's Azimuth from the North required.

The Operation by Gunter's Scale

The Extent of the Compasses from Radius S. 90d. to S. 42d. 30m. the Complement of the Altitude, will reach from S. 38d. 28m. the Complement of the Latitude, to Sine 24d. 40m. then the Extent from Sine 24d. 40m. to Sine 75d. 14m. the half Sum, will reach from S. 5d. 44m. (the Excess of the half Sum, above the Complement Declination) to 122d. 42m. (upon the Line of versed Sines) which is the Azimuth required.

Example

Example 2. In the Latitude of 51d. 32m. North, the Sun's Declination is 18d. 15m. South, his Altitude 17d. 45m. and the Azimuth from the North required?

The Operation by the Logarithms.

d.	m.				
72	: 15	Compl. Altitude	—————	S. Co. Ar.	0.021183
38	: 28	Compl. Latitude	—————	S. Co. Ar.	0.206168
108	: 15	Declination 90 Degrees being added, because South.			
218	: 58	Sum			
109	: 29	Half Sum supp. to 180d. is 70d. 31m.	S. ———	9 974391	
1	: 14	Remainder	—————	S. ———	8.332920
		d.	m.	Sum	18.534666
		79	: 20	S.c. ———	half Sum ——— 9.267333
		79	: 20		

Which doubled is 158 : 40 the Azimuth from the North required.

By Gunter.

The Extent from Radius S. 90d. to the S. 72d. 15m. the Comp. Altitude will reach from Sine 38d. 28m. the Complement Latitude, to S. 36d. 20m. then the Extent from Sine 36d. 20m. to 70d. 31m. the Supplement of 109d. 29m. (the half Sum) to 180d. will reach from the Remainder 1d. 14m. to 158d. 40m. (upon the Lines of versed Sines) the Sun's Azimuth as above.

In South Latitude the Operation is the same with the two preceding Examples, only the Azimuth is found from the South.

After the same Manner you may find the Azimuth of any Star.

P R O B. IX.

The Latitude of the Place, the Sun's Declination and Altitude being given, to find the Hour of the Day.

Example. In the Latitude of 51d. 32m. North, suppose the Sun's Declination 23d. 29m. North, the Altitude 36d. 30m. in the Afternoon, and the Hour from Noon required.

The Rule. Take the Complement of the Declination, the Complement of the Latitude, and the Complement of the Altitude, add them together, and take the half Sum, subtract the Complement of the Altitude from the half Sum, and take the Remainder, then set down the Complement

ment Arithmetical of the Sine Complement of the Declination, and Complement of the Latitude, and thereto add the Sines of the half Sum and Remainder; half the Sum of these four Logarithms, is the S.c. of the half Time required in Degrees and Minutes of the Equinoctial.

The Operation by Logarithm.

d.	m.					
66	: 31	Compl. Declination	—	—	S. Co. Ar.	0.037547
38	: 28	Compl. Latitude	—	—	S. Co. Ar.	0.206168
53	: 30	Compl. Altitude				
158	: 29					
79	: 14	Half Sum	—	—	Sine	9.992287
25	: 44	Remainder	—	—	Sine	9.637673
					Sum	19.873675
d.	m.					
30	09	S.c.	—	—	Half Sum	9.936837
30	09					

which doubled is 60 18, and reduced into Time, makes 4 hours 1 min. $\frac{1}{2}$ the Hour of the Day in the Afternoon.

But if it been in the Forenoon, 4 hours 1 min. $\frac{1}{2}$ subtracted from 12 hours, leave 7 hours 58 min. $\frac{1}{2}$ for the Time in the Morning.

If the Declination had been Southerly, then instead of taking the Complement of the Declination to 90 deg. there must be 90 deg. added thereto, as in the second Example of the Eighth Problem; do the same when the Declination is North in South Latitude.

By Gunter.

The Extent of the Compasses from Radius S. 90d. to S. 66d. 31m. the Complement of the Declination, will reach from S. 38d. 28m. the Complement Latitude, to S. 34d. 40m. then the Extent from S. 34d. 40m. to the S. of 79d. 14m. the half Sum, will reach from S. 25d. 44m. the Remainder, to 60d. 18m. (upon the Line of Versed Sines) the Hour of the Day as above.

P R O B L E M X.

Having the Latitude of the Place, the Sun's Right Ascension, with the Right Ascension, Declination, and Altitude of a Star given, to find the Hour of the Night.

Q

Example,

Example.

In the Latitude 51 deg. 32 min. North, on the 18th of January, 1765. the Sun's Right Ascension is 20 hours 2 min. the Right Ascension of the *Lion's-Tail* was 11 hours 37 min. the Declination 15 deg. 54 min. North, the Altitude 30 deg. 30 min. to the Eastward of the Meridian, the Hour of the Night required.

The RULE.

Take the Complement of the Star's Declination, the Complement of the Latitude of the Place, and the Complement of the Star's Altitude; add them together, and take the half Sum, subtract the Complement of the Altitude from the half Sum, and reserve the Remainder; then set down the Complement Arithmetical of the Sines of the Complement of the Star's Declination, and of the Latitude of the Place, and thereto add the Sines of half the Sum and Remainder: Half the Sum of these four Logarithms, is the S.c. of half the Star's Distance from the Meridian.

The Operation by Logarithms.

d.	m.				
74	: 6	Comp. Star's Declination	_____	S. Co. Ar.	0.016942
38	: 28	Compl. Latitude	_____	S. Co. Ar.	2.206168
59	: 30	Compl. Star's Altitude	_____		
172	: 04				
86	: 02	Half Sum	_____	Sine	9.998951
26	: 32	Remainder	_____	Sine	9.650034
				Sum	19.872102
30d.	20m.	S.c.	_____	Half Sum	9.936051
30d.	20m.				

which doubled is 60d. 40m. and reduced into Time, gives four Hours, two Minutes forty Seconds, or three quarters of a Minute nearly.

By the Directions given in the Use of the Table of the Sun's Right Ascension, and of the Right Ascension and Declination of the fixed Stars, find the Time of the Star's coming upon the Meridian, if the Star be to the Eastward of the Meridian, subtract the Star's Distance from the Meridian in Time, from the Time of the Star's coming upon the Meridian; but

But if the Star be to the Westward of the Meridian, add the Star's Distance from the Meridian, to the Time of the Star's coming to the Meridian; the Sum or Difference is the Hour of the Night. In this Example, the Sun's Right Ascension 20 Hours 02 Minutes, subtracted from the Star's Right Ascension (with 24 Hours added thereto) 35 Hours 37 Minutes, leaves 15 Hours 35 Minutes, the Time of the Star's coming on the Meridian; from which subtracting 4 Hours, 3 Minutes, 40 Seconds, the Hour above found, leaves 11 Hours, 31 Minutes, 20 Seconds, the Hour of the Night.

Note farther, If the Star's Declination be South in North Latitude, or North in South Latitude, instead of taking the Complement of the Declination to 90 deg. there must be 90 deg. added thereto, as has been shewn in the Eighth preceeding Problem.

The Operation by Gunter's-Scale.

The Extent of the Compasses from Radius S. 90 deg. to the S. of 74 Degrees 6 Minutes, the Complement of the Star's Declination, will reach from S. 38 Degrees 28 Minutes the Complement of the Latitude, to the S. 36 Degrees 45 Minutes; then the Extent from the S. 36 Degrees 45 Minutes, to S. 86 Degrees 2 Minutes the half Sum, will reach from S. 26 Degrees 32 Minutes the Remainder, to 60 Degrees 40 Minutes (upon the Line of Versed Sines required;) with which proceed as has been directed to find the Hour of the Night.

Courses and Distance between some of the most eminent Places on the Coast of England, &c. As also the thwart Courses between the East Coast of England und Holland, the South Coast of England and France, and the West Coast of England and Ireland.

	Leag.
FROM <i>Whitby</i> to <i>Tinmouth</i> , NW. by N. - - - - -	14
From <i>Buchaness</i> to <i>Cathness</i> , North West - - - - -	27
From the <i>North Foreland</i> to <i>Flushing</i> , East - - - - -	24
From the <i>North Foreland</i> to the <i>Texel</i> , NE. by N. half E. - - - - -	50
From the <i>Spurn</i> to the <i>Texel</i> , East by South - - - - -	55
From <i>Tinmouth</i> to the <i>Naze of Norway</i> , NE. by E. - - - - -	118
From <i>Tinmouth</i> to <i>Holy Land</i> . East by South - - - - -	110
From <i>Tinmouth</i> to the <i>Scaw</i> , East North East - - - - -	110
From <i>Yarmouth</i> to the <i>Texel</i> , East by North - - - - -	34
Q 2	From

	Leag.
From Newcastle to Maes Deep, ENE. ————	83
From Aberdeen to Maes Deep, South East ————	113
From the North Foreland to the Maes, ENE. ————	30
From Newcastle to the Fly, ESE. ————	90
From Scarborough to Holy Land, East Northerly ————	97
From the Start to the Eddystone, West half South ————	7
From the Land's-end to Scilly, WSW: three quarters West ————	9
From the Caskets to Blakeness, East North East ————	55
From Beachy to Blakeness, East a quarter North ————	15
From Dover to Diep, South half West ————	25
From the Lizard to Guernsey, East by South ————	35
From the Start to Seven Isles, South half East ————	25
From Scilly to Ushant, South East by South ————	35
From the Lizard to Ushant, South ————	29
From Hartland Point to the Island of Lundy, North ————	3
From Lundy to the Holms, East by North, Northerly ————	18
From Black Rock to Tuskar, East North East ————	3
From Cape Clear to Old Head, East by North ————	13
From Gresholm to Waterford, West by North ————	21
From the Land's-end of England to Tuskar, North by West ————	40
From the Land's-end of England to Waterford, NNW. ————	40
From Holy-Head in the Island Anglesea, to the Bar of Dublin, W. by N. ————	18
From Rochel to Black Rock, South by East ————	80
From the Land's-end of England to Cape Clear, NW. by W. ————	55
From the Land's-end of England to Old Head, North West ————	45

A TABLE of the Soundings coming into the Channel, respecting the Bearings and Distances of Scilly, Ushant, the Lizard, &c. with the Depth in Fathoms, and the various Sorts of Ground.

	Bearings.	Distance.	Lat. D.M.	Depth of W.	The various Sorts of Ground.
Scilly.	South.	05 50	20 50	50	Branny sand, like ground wheat.
	S S E.	05 50	12 45	45	White sand mixed with shells.
	S S E.	06		50	Coarse ouse.
	E S E.	06		53	Coarse sand and fine red shells.
	E by S.	08 50	12 78	78	Ouse sand, Queens shells amongst it.
	E by N.	07 49	15 72	72	Ouse like mustard seed with broken shells.
	E by N.	15 48	50 72	72	Pepper sand, black and yellow. Scilly

Soundings coming into the Channel.

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	Bearings.	Dist.	Lat.		Depth	The various Sorts of Ground.
			D.	M.		
Silly.	E. by N.	24	49	50	72	Black, white and red stones with ouse.
	E N E.	07	49	15	60	Some black sand.
	E N E.	20	49	15	80	Rocky ground.
	E N E.	55			103	Fine white sand.
	NE by E.	22	49	10	85	Sand and ouse together.
	NE by E.	10	49	20	55	White and red sand mix'd with shells.
	NE by E.	50	49	50	100	White sand with ouse and nits.
	NE by E.	25	49	50	64	Branny sand with white and red shells.
	NE by E.	06	49	10	48	Black sand.
	NE by E.	13	49	43	65	Branny sand with some pieces of shells.
	North East	10	49	40	65	Branny sand, small stones, herring bones.
	NE by N.	10	49	20	57	Small red sand.
	N N E.	10	49	47	100	White sand then entring on the bank.
	N by E.	18			68	Red sand with black and white scollop shells.
	North	12	49	15	65	Broken shells with white and red sand.
	North	10	49	47	65	White sand on the East-part of the bank.
	N N W.	33	48	52	77	Red sand and shells amongst it.
	NW by N.	07	49	40	54	More shells, the <i>Lizard</i> NE. dist. 18 leag.
	North West	04	50	10	50	Branny sand with black and broken shells.
	North West	07	49	47	60	Stony ground.
	NW by N.	04	50	25	61	Red and black sand, with glistering shells.
	NW by W.	2½			44	Shells and sand like points of needles.
	W by N.	13	50	25	63	Fine white sand with little ouse.
	West	21	50	08	66	Red and black sand with glistering shells
	W by S.	32	49	50	75	Fine white sand and glistering shells
	W by S.	3½			40	Like broken wheat or coarse Bran.
Ushant.	North	06	48	36	63	Full of small maes sand.
	N by E.	18	48	15	80	Round stones mixed with scollop shells
	NE by N.	11			60	Small beaten shells and hakes teeth.
	North East	29	48	50	85	Great and small pieces of cockle shells.
	North East	25	48	10	55	Grey and brown sand with white shells.
	NE by N.	07	48	30	68	White and grey maes sand.
	E N E.	14	48	36	68	Small shells and herring-bones.
	E by N.	25	48	30	85	White and grey sand with small red stones.
	East	18	49	00	70	Branny sand with some shells.
	East	06	49	00	65	Red sand, shells, things like needle points.
	East	15	49	15	70	Fine white sand.
	East	33	49	15	87	Dazling sand like barley-straw.
	East	04	49	10	60	Full of maes sand and broken shells.
						E by S.

Soundings coming into the Channel.

	Bearings.	Dif.	Lat.		Depth	<i>The various Sorts of Ground.</i>
			D.	M.		
<i>Ushant.</i>	E by S.	14	48	56	63	Shells like Perriwinkles.
	E S E.	15	48	15	70	Shells grey and red pieces of Cockle shells.
	E S E.	12	49	20	68	Gross white sand with shells.
	E S E.	8	49	5	64	White shells and fine small stones.
	E S E.	6			61	Hakes teeth and shells like oatmeal husks.
	SE by E.	20	49	15	72	Great stones like pease and beans.
	SE by E.	9	49	15	65	Sand and some shells.
	SE by E.	37	48	30	65	James's shells.
	SE by E.	15	49	25	60	Small scollop shells, with some stones.

	Bearings.	Dif.	Depth	<i>The various Sorts of Ground.</i>
<i>Lizard.</i>	North East	6½	43	Marshy shells and some scollop shells.
	NE by N.	10	52	Marshy shells and Hakes teeth.
	N N E.	9	50	Marshy shells like Oatmeal husks.
	N by E.	15	58	Marshy shells and Hakes teeth.
	North	1	39	Stones as big as Beans four Leagues off.
	North West	5	45	Grey sand like Oatmeal flour.
	North West	3	46	Marshy shells like small stones.
	W N W.	3½	47	Small shingly stones, and marshy shells.
	W by N.	4	40	Fine marshy shells like white stones.
	W by S.	3	41	Black gravelly Ground with small stones.
	NE by E.	12	57	Scollop shells.
	NE by E.	4	44	Great stones and rough Ground.
	North East	6½	50	Like Husks of Oatmeal and small stones.

<i>Eddy Stone.</i>	N. ½ a Mile	35	Dirty brown sand and Hakes teeth.
	W. 2 Miles	34	Dirty brown sand.
	S. 1 Mile.	26	Fine sand, and within this 28 and 30 fathom.

<i>Start.</i>	N by E. N. ly	4½	40	{ Like the Dust of a Grindstone with Hakes Teeth and shells.
	NW. by W.	8½	43	
	NW. by N.	3	38	{ Gravelly sand, small stones and shells.
	N by W. ly	12	38	
	NW by W.	14	43	{ Redish shells mashed as if beat in a mortar.
				{ white sand and scollop shells.

Forceland

	Bearings.	Dift.	Depth	The various Sorts of Ground.
Foreland.	NE by E.	08	35	Small shingly stones as big as Pease.
	North	08	40	Streamy Ground with small stones.
	N by E.	5½	33	The same with some black sand.
	NE by N.	11	41	Fine sand and scollop shells.
	N N E.	08	40	Fine sand, scollop shells and small stones.
	NE by E.	2½	27	Shingly ground.
	W N W.	2½	20	Small stones.
Needles	NE by E.	02	17	Great shingly Ground.
	NE half E.	2½	17	Small shingly Ground.
	North East	02	13	Rocky Ground.
I Wight	N by W.	3½	20	All the Ground from St. Alban's to the East-end of the Wight is chalky and brown Sand.
	E by N.	04	21	
	N by E.	03	18	
Dunnose.	Wb y S.	04	16	Rough Ground with some big stones.
	West	04	21	A kind of sandy fishy Ground.
	W N W.	08	33	Fishy Ground somewhat red, with stones as big as Pease, and small Beans.
	N by W.	06	26	

Directions to sail into some of the Principal Harbours on the Coast of England.

Directions to sail into Scilly.

CILLY is divided into divers Islands; along the West-side lieth a great many Rocks. There are several Channels through which to go in, but the Southermost called St. Mary's Sound is the best, being a fair opening of the Channel, but near the Midst lie two sunken Rocks, which in foul Weather the Sea may be seen to break over: It is best to leave them on the Larboard-side going in, and on the Starboard-side coming out. Go so near the Starboard-shore, as that a Stone might almost be thrown on it. And when you are within the Point, luff up round, and come to an Anchor in Sight of the Houses; or when the Town is brought open to the Valley, leave two-thirds of the Harbour on the Larboard-side.

*To sail into some of the Principal Harbours**Directions to sail into Mount's-Bay.**To Anchor in Gover's-Lake.*

There are two sunken Rocks, which lie right in the Way of going into the Lake, about a Mile without your anchoring Place; these Rocks lie NNW. and SSE. about half a Mile in length, to shun which, observe the following Directions.

If the Wind is in the Eastern Hank, give the Eastern Shore about a League's Birth, and keep *St. Paul's Church* wholly in Sight above the Hill, 'till you bring a Church on the Eastern Shore a Sail's Breadth to the Northward of *St. Michael's Mount*, then bear away for the Lake Hill, keeping your Mark till you run *St. Paul's Church* down under the Hill, then let go your NE. Anchor, and carry the other to the SW. and you will be well moor'd, and in good fine Ground, all Sand.

You may come in, keeping one half of the Church above the Hill, you'll go clear of them to the Eastward, and when it shuts down you are to the Westward of them, and when upon them, the Top of the Tower and a long Hedge is in one, about 6 or 7 Feet at low Water.

If the Wind is in the Southern or Western Hank, keep the Land on board, which is bold; you may go within a Quarter of a Mile of the Point; run till you shut *Moufehole Island* in, and *St. Paul's Church* down under the Land well, to come too with your SW. Anchor, then carry the other to the NE. you will be well moor'd in fine Ground as before-mentioned; Be sure to have the Church on the Eastern Shore a Sail's Breadth to the Northward of the Mount.

If your Ground Tackling is good, your Anchors will never start, the Wind at SSE. or SE. heaves in a great Sea, and raises a great Ground Sea when it blows hard; the harder it blows you have a stronger Outset in your Favour; there is no Tide, you always ride Head to Wind, your Anchors will sooner start with the Wind to the N. or NW. because the Ground goes out with a little Descent.

To sail into Foy.

Foy may be very easily known, lying in between two high Lands; on the West-side going in, is an old Church and Castle, and on the East-side the Ruins of an old Church, as you may see by the making of it in *Capt. Collin's Draught of Foy*. The going in is a Cable's Length over from Side to Side, and no Danger; when you are in you may Anchor before the Town, or run up above the Town. In the Time of the *Dutch War*, in the Year 1666, there was above sixty Sail of *Virginia Ships* put into this Harbour. This Place lieth NE. and SW. in and out, which makes it a better Out-let to the Westward than *Plymouth* or *Falmouth*. And whereas it

It hath been reported to be a Bar Harbour, and that you cannot enter till half Tide, I do assure you that there is no less than three Fathom at Low-water at a Spring-Tide; here you may lie ashore to wash, tallow, or stop Leaks; the Spring-Tides rise and fall 16 or 17 Feet, and it is High-water here at Full and Change a Quarter past Five. There is good Anchoring in the Road without the Harbour, from 5 to 10 Fathom Water, but without that Depth foul Ground.

To sail into Falmouth.

Upon the West Point of the Haven of *Falmouth*, standeth a Castle on the high Land, called *Pendennis* Castle. In the Entry nearest the said West-side, lieth a Rock above Water, you may sail in on either Side of it, on the Inner-side of the East Point lie also some Rocks off the Shore; on the East side is deepest Water, and most Room, therefore in going in, give the East-Point a large Birth; there will be 7 or 8 Fathom. Keep the said Shore till you come within *St. Maud's* Castle; which when it bears East, there will be 16 or 17 Fathom, but half the Harbour over towards the *Smithick* is but 4 or 5 Fathom; observe in going in to keep the *Manacles* open and shut on the Point of *Falmouth* Castle, and so it must be kept till you shut the Church over *Penny Comquick*, into the North East-end of the *Smithick*, and so bear over to *St. Maud's*, and ride with the Castle East, laying one Anchor in 18 Fathom, and the Westermost Anchor in four Fathom, as shall be most convenient.

To sail into Plymouth.

At the Eastermost Point of *Plymouth* Sound lieth a high round Rock called *Mewstone*; between it and *Ramhead* lieth the said Sound, North North East, being round and deep.

A little to the Northward of *Ramhead*, is a fair sandy Bay, where is good Anchoring close under the Land, in 9 or 10 Fathom: South a little Easterly from *Ramhead*, lies a Rock above Water called the *Eddystone*, (on which is erected a Light-house) the Point of *Plymouth* lies from it N. by E. distant about 4 Leagues.

In the Sound, by the Land of *Plymouth*, lieth an Island called *St. Nicholas* or *Drake* Island, which is joined to the West-side with a Range of Rocks under Water, so that you may sail along to the Eastward of it.

To sail into Catwater.

To sail into *Catwater*, run in between the Island and the Point on the East-side of the Land of *Plymouth*, till *Catwater* open on the Starboard-side, then go in to the Eastward between the Point of *Plymouth*, and the
R Point

Point, on the Starboard-side, leaving most Part of the Channel on the Starboard-side, until you come within the Point, and anchor there right against the high steep Northern Land; there is at Low-water, with extraordinary high Tides 4 and 5 Fathom.

In sailing into *Catwater*, be sure to give a good Birth to the Southern Point of the Entry, for there lies off the said Point a Ledge of Rocks under Water, about two Cables Length off from the Land. Upon the Point of the Ledge lies a Buoy, where is about twelve Feet Water at half Flood, which Buoy must be left on the Starboard-side going in, and when *Catwater* is altogether open you may run in to the Eastward, leaving in the Entry of the Harbour two-thirds of the Channel on the Starboard-side, as aforesaid, because the South-shore is somewhat flat off, there lying a sandy Bank, which reaches to the Second Point of the South-shore of *Catwater*.

A little to the Eastward of *Drake Island* lies a Rock under Water, upon which at Low-water it is not deeper than two Fathom. To sail within the Land you may go to the Eastward or Westward of the Rock, as Occasion serves.

To sail into Dartmouth:

Dartmouth hath a narrow Entrance lying in between two high Lands: On each Side of the Haven standeth a little Cattle; on the West-side is a Church on the high Land, called St. *Patrick's Church*. To sail in, coming from the Westward run in along by the West Land, so far to the Eastward until the Key of the Village (on the East-side of the Haven) be brought in the midst of the Entry of the Haven between the two Lands: It's convenient to have a Boat ready (if any Gust of Wind should come from the high Land) to tow in. Being come in, edge over to the West-side before the Brewhouse, and anchor there in 10 or 11 Fathom, or before the Village to the East-side at Pleasure; At the East-side lieth a sunken Rock, to avoid which steer in with St. *Patrick's Church*, and do not bring the Village which standeth on the West-side of the Harbour, without the said Church, but keep the outer House of the said Village in the East-side of the Chapel, always in Sight, without the Bulwarks on the North-side by St. *Patrick's Church*, then there is no Danger of the Rock, in the Range by the North Point. Between *Dartmouth* and the *Start*, nearest to *Dartmouth*, standeth a white square Steeple, called *Fackman*, which is a very good Mark to know *Dartmouth* by.

To sail into Torbay.

Bring the West Point of the *Berry S.* by E. or SSE. from you; and anchor there in 7 or 8 Fathom, where you shall be Landlock'd for a S. and SW.

SW. Wind. At the North East-end of the Bay is also a Tide Haven called the *Tormain*; before it is very good Anchor Ground in 4 or 5 Fathom, according as you desire to be nearer or further from the Shore.

Directions for sailing in at the East-end of the Isle of Wight to Portsmouth Harbour, and also to Hampton.

If you come from the Eastward with a Northerly Wind, bound into the *Isle of Wight* or *Portsmouth*; after you come to the Westward of the Shoal called the *Ower*, hale in North West with St. *Hellen's* Point; but do not hale too much to the Northward, for there lies a Bank off of *Langstone* Haven to the Eastward of the *Horfe*, that hath not above 13 Feet on it at Low-water; but keeping in 7 or 8 Fathom, carrieth you clear without it, and will bring you to the SE. End of the Sand called the *Horfe*. St. *Hellen's* Church being SW. by W. from you, you may run in 5 Fathom, and when you have brought the Westermost great white Patch, or Chalk upon *Post-Down* (which is the high Land to the Northward of *Portsmouth*) a Ship's Length to the Westward of *South-Sea* Castle that stands upon the Beach, then you may luff up without Fear: Being then to the Westward of the *Horfe*, and steering with that Mark, it will lead you in along the *Horfe* unto the Beach, and so into the Harbour of *Portsmouth*, keeping along close by the Shore, until you come by the Town-wall's End, and there you must bear off a little for a Flat, that lieth off from the Shore, this is for an Easterly Wind. But if you intend for *Stokes-Bay*, when you have brought the Fire Beacon on *Brown-Down*, (which is to the WNW. of *Hastlewood* Point) within a Ship's Length without the said Point, then you may bear to the Westward along the Outside of the *Spit*, which is the Shoal on the West-side of the Entrance of *Portsmouth* Haven.

If the Wind be Westerly or Southerly, and you are coming from the Westward, and design for St. *Hellen's* Road or *Stokes-Bay* (from *Dunnose* to St. *Hellen's* Point, the Course is NE. by N. and NNE.) but borrow no nearer to St. *Hellen's* than 6 or 7 Fathom, for the Spit lies off a great Way; but if it be clear Weather, that you may keep *Sand-Down* Castle open of the *Culver Cliff*, that Mark will lead you without the *Spit* of the Point; steer along in this Mark until you open St. *Hellen's* Church about two Ship's Length open of the *Red-Cliff* within St. *Hellen's* Point or *Port-Sea* Castle to the Eastward of *South-Sea* Castle, then are you clear of the Point, and may steer to St. *Hellen's* Road NW. and having brought the Point S. by W. or between that and the S. by E. you may anchor in 7 or 8 Fathom Water, on very good Ground.

Note, That you have no good clear Ground all along the Island, until you have opened *St. Hellen's Church*, as aforeaid, and have brought the Point to bear from you SSW.

From *St. Hellen's Point*, to go between *No-Man's-Land* and the *Horse*, the direct Course in, is NW. by N. and NW. but you have no Shoaling upon the SW. side of *No-Mans-Land*, for you have 16 Fathom, and the next Cast but 3; but at the *Horse* you may stand into 10, 9 or 8 Fathom: If the strong Tide be spent, and smooth Water, you shall have a great washing of them by the Overfall of the Water; but especially on *No Man's-Land*, if it be clear Weather, there are two very good Marks to lead you in, which are as follow; keep the two Windmills on the *Downs* on the Isle of *Wight*, that they may be seen clear all over the Trees between you and them, but no more above them than even clear; this Mark will lead you in, and so up all along the Island without some middle Ground that lieth SSW. off the Point *No-Man's-Land*.

Also from *St. Hellen's Point* (if it be clear Weather that you can see it) there is a direct Mark, viz. a Part of an Old Castle formerly called *Hastewood Castle*, standing on *Gilkicker Point* (which is kept white,) keep *Gosport Church* and that Castle in one, or this Castle in the Middle of the Wood about the Church, which sheweth with a Valley like a Saddle, and so you may run directly in without Fear. Or if the Wind be so that you are forc'd to turn in, then you may run the said Mark within two Sail's Breadth of each End of the Wood. In the Middle of the Channel is about 11 Fathom Water; and if you bring the said Mark right under the North End of the Wood, you shall run in a middle Ground near the *Horse*, that hath not above 10 Feet on it at Low-water, and hard Sand.

Being in *Yarmouth Road*, and you would sail out of the *Needles*, steer away from *Hurst Castle*, which Place is very steep; being past the Castle, steer away for the *Needles*, which are sharp white Rocks; giving a Birth to some Rocks that lie off from the Island-side in the Fair-way, between the Castle and the *Needles*, you must keep close to the *Needles*. The Tide of Ebb setteth on the *Shingles*, which are hard Stones. The Flood setteth on the *Needles*.

To sail into the *Needles*, you will know the going in by the high white Land which is the West-end of the *Isle of Wight*; run boldly in with the Land, till you see the *Needles Rocks*, and then keep close to them, observing the Tides, as in the Directions coming out. *Note*, That there is a strong Indraught that sets in at the *Needles*, and into *Pool*; which Indraught hath haul'd many Ships into *Freshwater Bay*. Keep in 25 and 30 Fathom, and you need not fear the Indraught of the *Wight*.

To sail within the Wight in thick Weather.

To sail between the Main and the *Wight* in thick Weather, borrow in 6 Fathom off *St. Hellen's*, and steer NW. by N. and NNW. from *St. Hellen's Point*,

Point, till you have 12 Fathom, and then steer more Westerly, as you find the Depth; come no nearer *No-Man's-Land* than 9 or 10 Fathom; in that Depth you may keep along the *Wight* Side, if the Wind be Southerly; but if it be large keep in 14 or 15 Fathom, which is a good Birth from both Sides, and so steer W by S. and WSW. as you find the Depth until you come to *Cowes*. Note, That being about *Stoke's-bay*, there will be less Water; if you go nearer to *Cowes*, there you may anchor in 12 or 14 Fathom, in the midst of the Channel, where is ousey Ground.

Directions for Dover-Road.

The best Ground in *Dover-Road* is with the *Whiteway*, to the NW. of *Dover-Castle*, or between that Hill that comes from St. James's Church, which is a flat Steeple at the North-end of *Dover Town*, for a thwart Mark, and so in what Depth you please, from 12 to 14 Fathom. Thwart of *Foulstone* in 12 or 14 Fathom is very good Ground.

Direction to sail into the North-Foreland through the Gulls in the Night.

If your Ground Tackle should fail in the Night riding at the *North-Foreland*, as very often hath happened, and you cannot weather the *Foreland*, weather the *Northsand head*; if you can see but the *North-Foreland Light*, when that Light-house bears NW. or NW. by N. then bear over into 8 or 9 Fathom, and being in that Depth (steering SSW.) you may be sure it will carry you directly through with the *Brake*, by keeping your Lead carefully, and borrowing no nearer the *Brake* than five Fathom, nor going without 9 Fathom, or 9 and a half, as you have the Tide under you; this Course will lead you through without Danger.

Directions for the North-end of the Goodwin, for such as sail from the North-Foreland to the Southward in the Night.

If you be at the *North-Foreland*, bound for the *Downs*, and the Tide fall out too early or too late; to turn into the *Downs* with the Wind at SW. or SSW. take the following Directions.

If it be in the Morning before Day, then be sure to weigh Anchor in convenient Time, to be at the *North-sand-head* at the turning of the Tide to the Southward. From the *Foreland* you may steer out with a Flood Tide, SE. by E. and SE. or keep the Light of the *North-Foreland* NW. by N. this Course will lead you out. But for the more Certainty, be sure keep the Lead well, and then you may borrow off and on with the foresaid Winds in 7 or 8 Fathom, and steering out with the foresaid Course, you shall find the Depth suddenly change to 15 or 20 Fathom:
then

then you may hale close up to the Southward, along the Back of the *Goodwin*, the Eastermost-side of which lies SSW. and NNE. 12 or 14 Fathom, and is not above a Saker-shot from the Sand. But if it be in the Day Time, and the Wind blows so hard that you cannot well tack to run through the *Gulls*, then the Marks to carry you out at the *North-sand-head*, is a flat Church upon the *Foreland*, called *St. Peter's*, a Ship's Length to the Northward of *Broad-stairs* Pier-head; or borrow upon the Sand by the Lead as aforesaid, and so taking the first of the Tide without the Sand, you may stand to the South Eastward, till the *South-Foreland* bears W. by S. then cast about, and you shall weather the *South-sand-head*, and be in the *Downs* Road as soon as any other Ship that parted with you at the *Foreland*.

Directions for sailing over the Spits, the Wallet, and by the Naze into Harwich.

Sailing down the *Swin* or *King's-Channel*, and that you would sail into *Harwich* over the Buoy of the *Spits* into the *Wallet*, you must observe your Tides, for at the *Spits*, the Buoy lieth in 5, 6 and 7 Feet Water at Low-water, and the Passage often alters, sometimes more Water, sometimes less. The Buoy lieth on the West-end of the *Gunfleet-sand*, and the East-end of the *Buxey*, bearing from a flat Steeple, called *Great Holland Church*, South by East. Being over the *Spits*, you come into the *Wallet*, where is very good Anchoring in five, six, seven and eight Fathom Water; the Sands lying without, makes it a most excellent Road. There is a good and deep Channel to sail in at the *Wallet* between the *Gunfleet* and the *West Rock*, but 'tis seldom used. Being over the *Spits* in the *Wallet*, steer away for the *Naze*, which may be known by the Trees, and a House that standeth on it, keep about half a Mile, or a Mile off from the *Naze*, to avoid the Stone Bank, which hath but 5 Feet Water on it at Low-water; and lieth from the *Naze* Trees E. by N. About a Mile and an half from the *Naze* Point, there is about 8- or 9 Feet Water between it and the *Naze* at Low-water; Keep *Payn's* Trees that lie a little to the Southward of *Harwich*, open and shut with *Harwich-Cliff*, and this Mark will carry you on the Stone Bank, and the Trees on the *Cork-land*, just open of the *Naze-land*, will carry you on the Bank also. There is a good leading Mark to carry you between the *Naze* and the Stone Bank, which is *Harwich* Steeple, on *Harwich* Beacon Cliff, which will also carry you between the *Pyesand* and the Ridge, into the *Rowling-Grounds*, where the Ships anchor in 3 or 4 Fathom at Low-water. The Mark to anchor in the best off the *Rowling-Ground*, is to bring *Harwich* Windmill two Sails Breadth open of *Harwich-Cliff*: And to sail from the *Rowling-Ground* to the *Naze*, keep *Payn's* Trees open off *Harwich-Cliff*, till you bring the
Naze

Naze to bear SW. then keep *Harwich* Steeple, on the Beacon Cliff, to run within the Stone Bank. There is a Channel to sail from the *Naze* between the Cork Sand and the Ridge, keeping the *Naze* Trees SW. sailing down NE. between the Cork and the Ridge, in 5, 6 and 7 Fath. Water. And when you have brought *Harwich* Steeple on the Brewhouse that lieth to the Northward of *Languard* Fort, then are you clear of the Cork Ledge; this Channel is much used by the Light Colliers going to the Northward.

Being in the *Rowling-Grounds*, and that you would sail into *Harwich* Harbour, keeping close by the *Andrews*, which is a Sand that lieth off from *Languard* Fort, and is steep too on the West-side; The Tide of Ebb runneth strong over the *Andrews*, the first half Ebb, of which you must have a Care. This Sand is dry at Low-water; keep close by the Beach of *Languard* Fort, to avoid the *Altar*, which is a small stony Shelf that lieth right West from *Languard* Fort, about a Cable and an half's Length from the Beach at the Fort, on which is but 5 or 6 Feet at Low-water. You may sail to the Westward of it, between it and *Harwich* Cliff, according as the Tide is up, and what Draught of Water your Ship draweth: But if you should want to go into *Harwich* at Low-water, and your Ship draweth above 15 Feet, you may stay for the Flood to have Water over the *Glutton*, which is a narrow Ridge that stretcheth off from the Beach thwart the Channel, a little within the Brewhouse, that is to the Northward of *Languard* Fort. Being past the *Glutton*, you must keep close to the Beach to avoid the *Gristle*, that lieth in the Middle between *Harwich* and the Beach of *Languard* Fort, on which is but three Feet at Low-water, there is a small Channel between the *Gristle* and the *Guard*, of nine Feet at Low-water, but when you have opened *Dover* Court Church off *Harwich* Town, then you are clear of the *Gristle* and the *Guard*, and may anchor before the Town of *Harwich* in five Fathom Water, or run into *Ipswich* Water and anchor; this is a very safe Harbour, and if a Ship should chance to blow a-shore she can take no Harm, the Shore being soft and ousy. The Spring Tides rise 15 and 16 Feet, and the Neap-Tides 10 and 11 Feet:

Directions to sail into Harwich through the Sled-way.

Being at the Buoy of the *Spits*, and you are not minded to sail over the *Spits*, then keep down by the *Gunfleet-sand*, in 7 and 8 Fathom Water, till you come within two Miles of the Buoy of the *Gunfleet*, and then come no nearer than 9 Fathom Water, for there lieth off a *Spit* ESE. from the Sand about a Cable's Length; to the Eastward of this *Spit* is a small Swatch through the Sand, into which, and *Goldmore's Gat*, the Tide of Flood setteth strong into the *Wallet*; of which you must have a
Care

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Care when you come near it, especially in little Winds or Calms, you may be hauled on the *Gunfleet-sand*; this Sand lieth NE. and SW. and drieth in several Places: The Buoy of the *Gunfleet* beareth from the *Naze* SE. by E. Easterly; you may stand into 7 or 8 Fathom along the Side of the *W. Rock* into the *Sledway*, keeping *Balfey Church* N. by W. and NNW. till you bring *Harwich Steeple* on the *Brewhouse* (that lieth to the Northward of *Languard Fort*) which will carry you clear of the *Cork Ledge*, on which is two Fathom and an half at Low-water, and then stand to the Westward, and keep *Orford Church* and *Castle* open of *Balfey Church* a Sail's Breadth, 'till you have the Lights together, keep them so till you are past the *Andrews*, and then follow the former Directions for sailing into *Harwich*; you may stand in upon the *Platters* into five Fathom, on which Sand is but two and three Feet at Low-water; the *Ridge* hath seven Feet at Low-water; a great Part of the *Cork Sand* drieth at Low-water; and lieth in Length NE. and SW. about two Miles and a half long, and a Mile broad: *West Rocks* lie in Length NE. and SW. about three Miles, and two Miles broad; and drieth in several Places, full of Banks and Swatches, the Ground rocky and stony in many Places; there is a small narrow Channel between the *West Rocks* and the *Cork*.

For the more particu'ar Directions for sailing into these and other Harbours in *England, Scotland, Holland, Normandy, Bretagne, &c.* see the last Edition of the *COASTING-PILOT*, newly Corrected, and Reprinted for J. MOUNT, and T. PAGE, on *Tower-Hill, London* with many Additions.

F I N I S.



